FACTORY

MANAGEMENT AND MAINTENANCE

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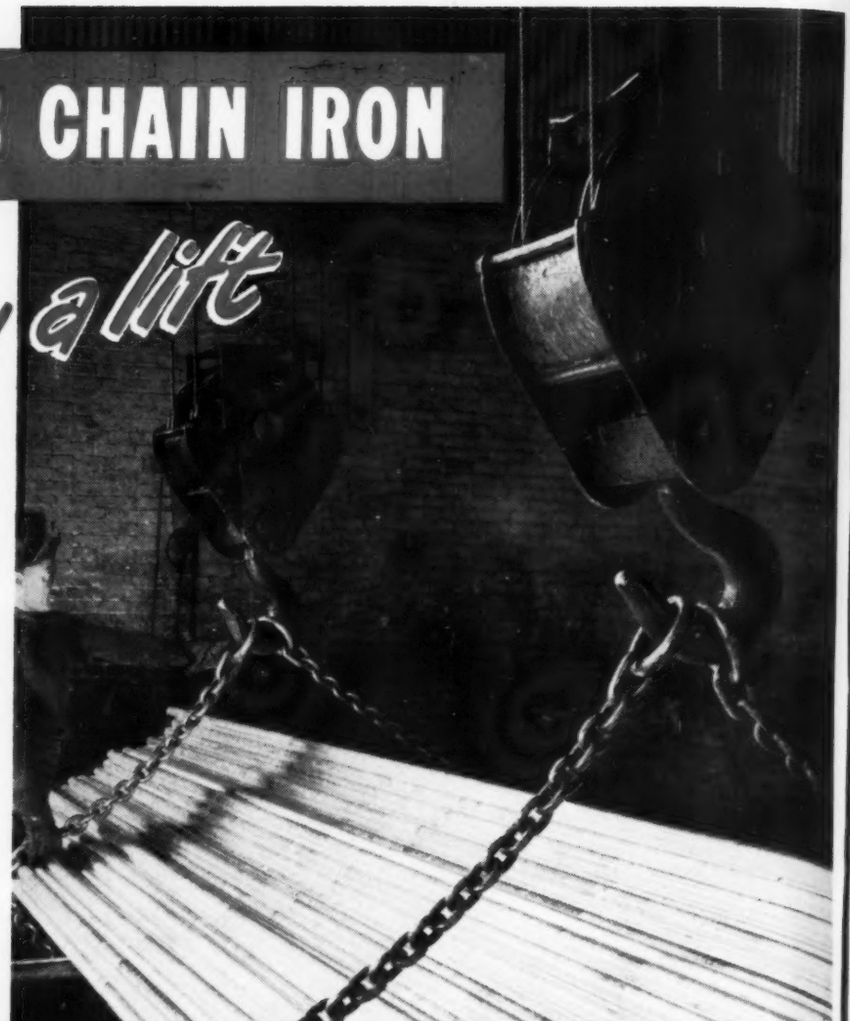

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MANAGEMENT AND MAINTENANCE

November, 1945

The German Economic Peace—Hard, Soft, or Workable.....*James H. McGraw, Jr.* preceding page 81
A Solution to the Labor Problem.....*L. C. Morrow* 81
Repeal the Smith-Connally Act Now..... 82
What I See Ahead in Labor Relations.....*L. B. Schwellenbach* 88
Built-In Pallets Cut Scrap-Handling Time.....*Forrest MacDonald* 92
One-Girl System Provides Perpetual Inventory.....*E. N. Reynolds* 94
Dramatizing Personnel Policies..... 97
One-Fifth the Paperwork, But Closer Control.....*Louis A. Hradesky* 109
Proper Placement Eases Veterans' Return to Work.....*Don S. Miller* 114
Selling the New Layout.....*George DeVries* 116
Simplified Formulas Put More Jobs on Incentive.....*Murray A. Young* 118
Matching Worker to Job..... 123
Tighter Defense Against Occupational Disease 124
Merit Rating System for Supervisors.....*C. K. Haas* 127
Significant Labor Developments.....*Benjamin Werne* 230
Avoiding Suggestion System Pitfalls.....*Damon Carter* 282
Maintenance as the Editors See It (*editorials*)..... 134
Planning Machine Moves.....*H. M. Bradley* 135
Standardized Factory Facilities *(Plant Operation Library No. 90)* *Robert MacLatchie* 139
How to Install and Maintain Electronic Controls—Part 1.....*H. L. Palmer* 147
Inspection Plan Improves Plant Housekeeping.....*V. McCabe* 150
City Firemen Boss Plant Protection Program.....*Howard L. Fleck* 152
Low-Cost Battery Charging.....*Walter B. Atchinson* 155
Preventive Maintenance Cuts Downtime 87 Percent.....*J. F. Boyd* 156
Welding Equipment 160
Data Sheets: Causes of Defects When Welding Stainless Steels..... 168

Management Shorts .. 131
Maintenance Shorts .. 164
Equipment News..... 172
You Want to Know.... 220

They Say and Do..... 252
Books 302
Calendar 306
Catalog Service 314

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THE GERMAN ECONOMIC PEACE HARD, SOFT... or WORKABLE?

IT is not surprising that difficulties are being encountered in spelling out the detailed terms of the German economic settlement.

The problem is exceedingly complex. The German economy is more or less inextricably bound up with the economy of continental Europe. Before the war that area—excluding the United Kingdom, Ireland and Russia—accounted for approximately one-fourth of the world's production, and for more than thirty-five per cent of world import and export trade. Germany's production constituted almost one-third of the output of continental Europe. It is obvious that the decisions we make now concerning the future German economy will exert profound influence not only upon the economy of Europe but also upon that of the world. It is clearly not practicable to plan for an expanding world economy unless provision is made for Europe generally to share in the development.

Despite the magnitude and complexity of the problems involved, it is crucial that we and our Allies come to swift and decisive agreement. Such agreement is important both to world economic reconstruction, and as a demonstration that those who won the war can reach accord on the terms of world economic rehabilitation.

We shall accomplish little if we continue to debate in terms of *adjectives*. Yet most of the public discussion to date has centered around whether or not the economic settlement with Germany should be *hard* or *soft*. To make progress we must focus instead upon *objectives*. A good program is one that will promote our objectives—a bad program is one that will not.

What Are We Trying To Accomplish?

Upon the economic objectives of the German peace settlement there is little fundamental debate. This is demonstrated by reference to a number of documents of recent release—the United States Directive to General Eisenhower of April 1945, the Report of the Tripartite Conference at Berlin of July, the Report of the American Advisors to the Office of Military Government of September. The latter document stresses fundamental difficulties in developing a practical program for carrying out the objectives of the other two, but it does not question their formulation of aims.

What are the objectives that we are seeking to forward:

1. The disarmament of Germany.

2. The elimination of German industries devoted primarily to armament production.

3. The assessment of reparations to compensate those nations which have suffered losses from German aggression through direct war destruction and through the German policy of confiscating industrial equipment to her own use.

How Far Are We Agreed on Procedure?

There is also a wide measure of agreement upon detailed procedure for carrying out these objectives. No one, of course, questions the policy of confiscating German arms. Equally, there is agreement that German industry devoted directly to the production of war equipment should be confiscated or destroyed, and that control measures should be instituted and sustained to prevent her from reconstituting such industries in the future. Since it is not practicable to prevent aircraft production and shipbuilding from being diverted to military use, these industries are included in the armament category. And similar reasoning generally extends the list of prohibited industries to ball bearings and abrasives.

There is an additional category of German production which all of the Allied powers agree should be uprooted and permanently barred. It embraces all economic activity which prewar Germany cultivated on an uneconomic basis through subsidy and other protection for the prime purpose of developing a self-sustaining economy to support aggressive war.

The major elements in this category are not difficult to define. A great German industry for the synthetic production of gasoline and other oil products from coal never operated upon an economic basis. The cost of such fuel products to prewar Germany averaged almost four times what it would have cost her to buy petroleum products in the world market. It is doubtful whether these plants could be operated postwar at a cost much below three times the world market price for competing petroleum products.

A similar situation applies to German synthetic rubber production. In an attempt to free herself at least partially from dependence upon supply lines, she produced synthetic rubber at a cost at least double the world market purchase price. Similarly, she protected or otherwise subsidized a considerable agricultural production, particularly in grains, for which her lands were so ill suited that Germans had to pay for German-grown wheat from three to four times the world market price.

These are merely outstanding examples. The maintenance of such activities in Germany constituted a drain upon the German economy rather than an advantage other than that of preserving a self-sufficiency necessary for war. Hence their elimination is clearly indicated, and generally subscribed to, though the job of defining a complete list is far from easy.

What Is The Area of Dispute?

Unfortunately, this total catalogue of agreed-upon measures is not sufficient to provide either adequate security against a resurgence of German militarism or satisfactory restitution to her European neighbors for Germany's ruthless destruction of their industrial plant and equipment. To serve these two ends it is necessary to cut down the margin of German dominance in heavy industry—in steel, in electric power, in machine tools, and other industrial equipment. Unless such steps are taken, Germany will emerge from the war with sufficient industrial power to provide a continuing and perhaps uncontrollable military threat; and we should be perpetuating a dominance that was developed, as a matter of German strategy, far beyond the requirements of her civilian domestic markets or the export potentials of normal trade.

German steel capacity was built to a wartime peak of twenty-four million tons a year. Before the war she had accumulated a store of machine tools greater than that of the United States, and her present stock of some four or five million tons of such tools is second only to ours. There is little debate over the necessity and justice of cutting down the margin of German dominance in heavy industry, particularly since it was built to its current levels through aggressive economic warfare to serve as an instrument of actual warfare. It is recognized, too, that in this sector of the German economy will be found the most useful reparations in kind for the countries damaged by German aggression.

The question is how much heavy industry and electric power equipment should be taken from Germany and transferred to others. The Russians, having experienced colossal war damage, are demanding very severe assessments. They talk of reducing postwar German steel capacity to three million tons annually.

The United States inclines to assessments in this field of less extreme dimension—we have suggested leaving in Germany an annual steel capacity of from seven to ten million tons. We naturally are concerned lest action be taken that will cause a complete breakdown of the German economy. If this should happen while we maintain occupational forces there, we should feel responsible for seeing that the Germans within our jurisdiction are provided with at least the means for subsistence. Furthermore, both we and the British know that in the long run our peoples will not support control measures over Germany which go beyond our concepts of reasonable fairness consistent with security requirements.

It is no part of our intention, as has been suggested by some, to provide for a German economy that will serve as a buffer against Russian expansion. We know, however, that our weakest course would be to commit ourselves now to continuing control measures which our people would later repudiate as falling outside democratic concepts of justice. On this issue we cannot, and should not, compromise.

How Can We Resolve Our Differences?

The best chance for resolving the differences which have appeared between the Russian position on the one hand and the American and the British position on the other lies in making a sharper distinction than has appeared in current discussion between long-term and short-term control decisions. All of us are agreed upon the policy of wiping out German military production and that part of German economic activity which has been run at economic loss to provide for a national self-sufficiency useful only for war purposes. But we are unwilling to enter into long-term commitments for holding down those parts of the German economy that do not constitute a war threat. That would unduly penalize future generations of Germans and drag down the whole economy of continental Europe.

It should be possible to reach agreement that measures for cutting down German heavy industries and power-generating facilities are immediate measures, and that no attempt will be made to sustain such controls over an extended period. If part of the German establishment in these fields is transferred to countries whose manufacturing resources have been damaged by German aggression, it can serve the purpose of effecting a reasonable balance without destroying utterly incentives for a new generation of Germans to improve by peaceful methods their status in a peacetime world.

Such a program is consistent with the concept of building a healthy and balanced European economy in which general economic interdependence provides one of the essential safeguards against a resurgence of German militarism. We must still face the problem of agreeing upon how far the non-armament segments of German industry can be cut back at the present juncture without leading to disastrous breakdown with its resultant chaos. Such definition, though formidably difficult, should not be beyond the capacities of the nations whose combined might brought victory, and who have the strongest of incentives for devising a lasting peace.

The key to agreement lies in each of us doing his best to understand the position of the other. Russia must recognize that we cannot get our people to subscribe to the permanent repression of a European economy which would deny to millions of people any hope of normal economic betterment. We should try to understand Russia's conviction that she is entitled immediately to reimburse herself for her war losses by drawing upon the German industrial establishment that still exists. It will help to resolve our differences if we separate in our thinking steps that require permanent controls from those which are merely temporary expedients.

Neither of us will be forwarding our ultimate and common objectives if we impose controls that blight the development of so large and important a segment of the world as continental Europe. In such a blight lies the germ of a Third World War.

President, McGraw-Hill Publishing Co., Inc.

FACTORY
MANAGEMENT AND MAINTENANCE
L · C · MORROW · EDITOR

A Solution to the Labor Problem

While the labor-management conference is in session, all management personnel will try to decide for itself what is wrong in the field of labor relations and what should be done toward correction. I offer here my own thoughts for whatever help they may afford.

Basically, the conception of labor relations as fostered by the national government is wrong. Our basic labor law is based on the assumption that the interests of management and labor are opposed. Therefore, the first corrective move should be the recognition by government that the interests of management and labor are the same. It should be followed immediately by whatever positive action would be required to encourage both management and labor so to conduct their bargaining that it would consist principally of figuring out how to produce more at less cost.

Government should then proceed on the basis that its real function is to see that nothing serves to deny to management and labor the opportunity to work cooperatively to see:

1. That labor is given increased compensation as production per man-hour is increased.

2. That every increase in wages received by labor is justified by increased productivity.

If government must subject workers to propaganda—a temptation that it seems unable to resist—the effort should be in the direction of convincing them that:

a. The more work they do, the more certain they are of keeping their jobs, because the more jobs there will be.

b. Complete automatic economic security is not a possibility, and they have some obligation to look after themselves by means of their individual efforts.

c. Part of the nation's tax bill always is taken from wages, and the higher the cost of government—including the cost of government-made jobs—the greater the percentage of wages paid out in taxes must be.

d. Prices of goods depend upon what people will pay, not how much the employer will ask.

e. Every increase in production cost results in lower real wages and therefore less purchasing power.

f. Honest employers and honest workers can get together and work out a fair deal when they build on the right foundation—which is producing more goods for more people at lower cost.

Government should greatly reduce its activities in the field of labor relations. It should take such action as will remove national emphasis from grievances and grievance procedures; and establish a balance between the "unfair practices" of labor and management. It should hold itself aloof from setting class against class, group against group, and offering to reward class or group with uneconomic alleged gains in return for support at the polls.

Management and labor would have to cooperate in specific ways. But the attitude and action of government proposed here would be primary requisites to a successful management-labor program of cooperation.

The type of bargaining which would be the result of the three-way cooperation proposed, would be certain to benefit all three participants—labor, management, and government.

L C Morrow

Repeal the Smith-

As INDUSTRIAL STRIFE INCREASES, Congress will face a bewildering variety of demands for labor legislation. No matter what else is done, there is one clear, concrete course of action for which every Congressman will wisely vote and that is immediate repeal of the War Labor Disputes Act, commonly known as the Smith-Connally Act.

It's a law that nobody likes. Organized labor opposed it from the start—and still does. Management, always dubious about it, now wants to see it wiped off the books. This is shown by a spot telegraphic poll which FACTORY conducted among representative management men (see page 84).

Even the House sponsor of the Act, Rep. Howard W. Smith (D-Va.) is seeking its repeal (see page 85).

The plain fact of the matter is that this "anti-strike" law has done little or nothing to curb strikes. On the contrary it is now a contributing cause of strikes, a strategic tool in the hands of labor leaders, and a useless and foolish burden on the taxpayer.

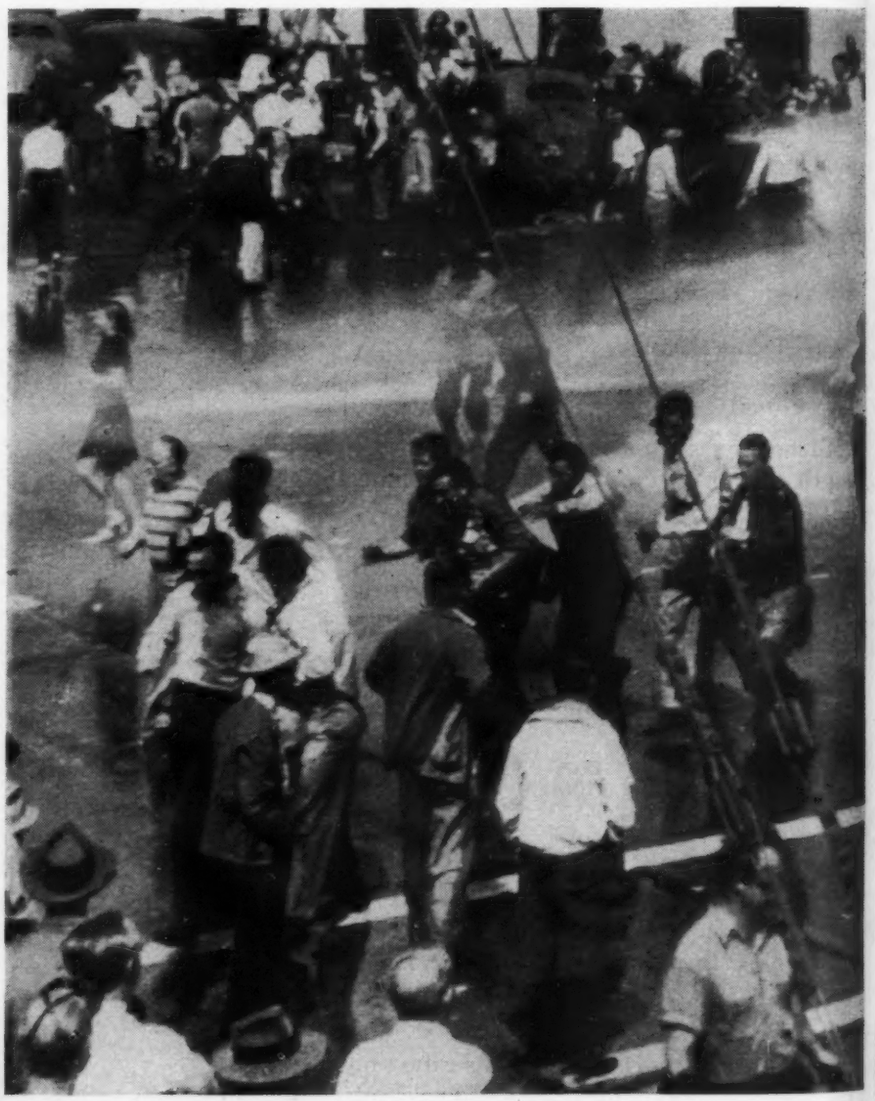
Strike Votes at Peak in September

Consider its essential absurdity. It is a "war" measure. Yet during September, in the first full month of peace, Smith-Connally strike vote petitions reached an all-time high. No less than 307 new cases were received by the National Labor Relations Board which is charged by the law with conducting the balloting (see chart on page 86). And this figure is deceptive because a single "case" may embrace 96 widely scattered plants, as in the case of General Motors, 20 in the case of Chrysler, 87 in the case of the pattern makers of Michigan, and 59 in the case of the New Jersey silk manufacturers.

The September wave of strike vote petitions confronted NLRB's operating machinery with a task both colossal and costly. For it meant that, if all these votes were taken on the prescribed thirtieth day following receipt of notice, a nose-counting job of unprecedented proportions would have to be done. NLRB officials were praying, with reason, that the bulk of the election requests would be withdrawn by the unions as, on the average, 60 percent of them have been in the past. For otherwise it meant that NLRB agents would have to set up polling places at or near all these hundreds of plants, seek out the employees thereof, and solemnly ask them a silly question:

"Do you wish to permit an interruption of war production in wartime as a result of this dispute?"

That is the exact language of the question NLRB is required to ask under present regulations. For the war is still officially "on" and will be until such time as President Truman formally announces to Congress that hos-



Designed to "outlaw" strikes, the Smith-Connally Act backfired, now ranks as a contributing cause of strikes. Strike vote provisions have proved pointless and have laid a burden on taxpayers

Connally Act Now

tilities have ceased. And even then the Smith-Connally Act will continue operative for a period of six months—unless something is done about it.

Fortunately, Congress can do something about it, if it will. The Act can be repealed at any time by joint resolution of both houses.

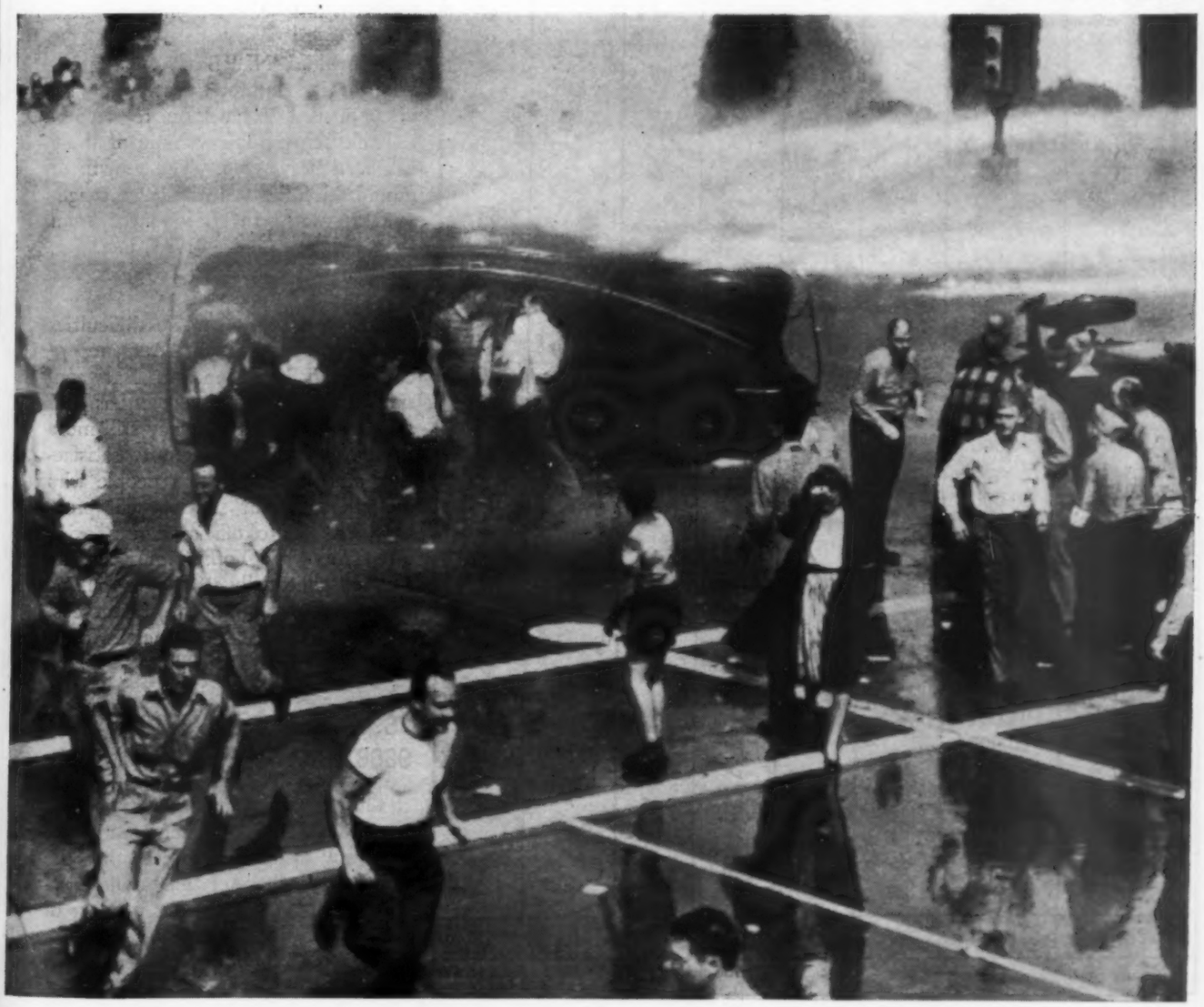
Voting Pointless—They Always Say "Yes"

But the real absurdity of the Act, under current conditions, lies less in the ridiculous nature of the question on which workers are asked to vote than in the fact that the vote is taken at all. For the outcome of every "election" is a definitely foregone conclusion. The workers always vote "Yes" (see chart on page 87).

In no important instance since the law became operative has a majority of workers—even at the height of the war—said "No." In 1943 an average of 68 percent of all workers voted to strike. In 1944 the figure rose to 72 percent, and in 1945 to date it has been 84 percent.

While the volume of these pointless election requests has been growing apace, their character has become steadily more complex. Industrial plant elections are by no means the only problem. For example, NLRB also has before it the task of polling the employees of 271 establishments of the Chicago transport industry—child's play compared with the request filed October 12 by the Brotherhood of Teamsters (AFL) for a strike vote in 3190 trucking companies in Ohio, Indiana, Michigan, Illinois, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, Nebraska, and

Press Association photographs



Management Favors Repeal

In a telegraphic spot survey, FACTORY asked representative men in management to give their views on Smith-Connally Act repeal. "Personal experience with the working of the Act" refers to Smith-Connally strike votes. The results follow:

Company tally number and location	Total wage earners employed	"Do you favor repeal of Smith-Connally Act?"		"Did you favor the Act originally?"		"Have you had personal experience with the working of the Act?"	
		YES	NO	YES	NO	YES	NO
1. R. I.	1,100	✓			✓	✓	
2. Conn.	455	✓			✓		✓
3. Mich.	2,000		✓		✓		✓
4. Ohio	30,000	✓			✓		✓
5. Ohio	1,500		✓	✓			✓
6. Ill.	1,000	✓			✓		✓
7. Ind.	3,000	✓		✓			✓
8. Pa.	9,100	✓			✓		✓
9. Mich.	12,000		✓	✓			✓
10. Del.	18,000	✓			✓		✓
11. Ill.	827	✓		✓		✓	
12. N. Y.	200	✓			✓		✓
13. Ohio	2,500	✓			✓		✓
14. Pa.	1,166	✓		✓			✓
15. Ohio	800	✓			✓	✓	
16. Pa.	8,500	✓			✓		✓
17. Pa.	12,500	✓			✓	✓	
18. Ill.	5,000	✓			✓		✓
19. Md.	2,000	✓		✓		✓	
20. Wis.	2,100		✓	✓			✓
21. N. Y.	250	✓			✓	✓	
22. N. J.	1,712	✓		✓			✓
23. Ind.	8,800		✓	✓			✓
24. Me.	1,725	✓			✓		✓
25. Ohio	3,181	✓			✓		✓
26. N. J.	350	✓			✓		✓
27. Pa.	650	✓			✓		✓
28. Pa.	4,000	*	*	✓		✓	
29. N. J.	590	✓			✓		✓
30. Pa.	30,000	✓		✓			✓
31. Md.	4,000	✓		✓			✓
32. Ohio	2,400	✓			✓	✓	
33. N. Y.	50,000	✓			✓	✓	
34. Conn.	5,000	✓		*	*	**	**
35. N. J.	6,000	✓		✓			✓
36. Conn.	3,200	✓			✓		✓
37. N. J.	3,600	✓		✓			✓
38. Pa.	104,031	✓		✓		✓	
39. Mo.	10,000		✓	✓		✓	
40. Conn.	653	✓		✓			✓
41. N. Y.	10,000	✓			✓	✓	
42. N. Y.	2,200	✓		✓		✓	
43. N. J.	5,000	✓		✓		✓	
44. Ohio.	2,800	✓			✓	✓	
45. Ind.	3,100	✓		✓			✓
Totals	**376,990**	**38**	**6**	**20**	**24**	**15**	**29**

* undecided **did not answer

Kansas—to say nothing of unknown hundreds more companies "operating in, into, and out of" the area.

Moreover, a vote was scheduled to be taken on all vessels in United States ports on which members of the Master Mates and Pilots Association of America might be found.

To Poll 600,000 Workers in Detroit Alone

Plainly the machinery of NLRB was never meant to carry such a load. The agency maintains a normal field force of about 300 persons. Had they the wings of Mercury, they could hardly cope with a single day's business such as that occasioned by Detroit alone, where, between October 24 and November 10, some 600,000 workers in 42 plants were scheduled to be polled. As a consequence, NLRB was laying plans to deputize college students and faculty members to help take the automotive strike votes.

Meanwhile, NLRB was falling behind in its statutory peacetime task of conducting Wagner Act representation elections. The volume of these has been heavy, too. The growth of unionization has continued throughout the war. In the months from July, 1944, to August, 1945, inclusive, there have been 7310 Wagner Act elections.

Now the administrative difficulties of the Smith-Connally Act are, of course, NLRB's concern. But consider the cost. The taxpayer has paid a pretty penny and will pay still more in the future for the empty satisfaction of determining that people who are talking about striking will probably strike. No official figures exist, but *The New York Times* has estimated editorially that the polling of 400,000 coal miners last year cost $250,000 and that the General Motors vote would cost $185,000.

769 Strike Votes and 9668 Strikes

The taxpayer might consider his money well spent, of course, if there were any evidence whatever that the Smith-Connally Act has done anything at all to decrease the number of strikes. But there is no such evidence. On the contrary there has never been any one month since the Act went

into effect in which the total number of officially recorded strikes did not exceed the number of Smith-Connally strike votes by a ratio of at least 4 to 1.

In fact, the NLRB's records show that 769 strike votes have actually been taken between August, 1943, and August, 1945, inclusive, while the Bureau of Labor Statistics reports 9668 strikes for the same period.

Not all the strikes listed by BLS were of the war-important sort against which the Act was aimed, of course, but the great majority of them must have been, since most of our industries and enterprises were engaged, directly or indirectly, in the war effort.

Why Bother to Ask Vote at All?

Now what does this set of figures show? Just this: When unions felt like taking a strike vote, they took one, but when they felt like striking without one, they struck anyway. In fact, the beholder is moved to wonder why in the world they ever bothered to take votes at all.

The answer is very simple. There have been many instances in which the strike vote proved strategically useful to unions. The taking of a vote has often helped to impart an air of government sanction to strikes—even strikes in violation of other provisions of the Smith-Connally Act, of labor's "No Strike" pledge, or of a collective bargaining contract. For another thing, it sometimes helped to make workers strike-conscious. The 30-day "cooling off" period, indeed, proved often to be a "warming up" period instead.

Frequently, unions urged members to vote "Yes" on the strike question while privately telling them there would be no strike. And sometimes they made good on it. The threat of a strike to which a majority of the workers involved had already signified support was enough to drive many employers into line. As a matter of fact, the mere filing of a request for a strike vote was often sufficient. Consequently, most cases never got to the voting stage. In this respect, the score, as of October 1, 1945, was: Total elections held, 769; total requests withdrawn, 1850.

This is a curious commentary on an Act which labor fought tooth and nail at its inception. Both CIO and

Why Sponsor of Act Now Favors Its Repeal

A statement specially prepared by Rep. Howard W. Smith (D-Va). for presentation with this article

The War Labor Disputes Act, commonly known as the Smith-Connally Act, was enacted by Congress over the President's veto purely as an emergency war measure. Strikes were hampering the production of weapons and supplies for the American soldiers whom Congress had drafted into the armed services. The seizure of private property needful in the production of war material and its operation by the government in order to quell labor disturbances was justified only as a war measure in a desperate emergency where no other course seemed to the Administration available. The administration of the Act and the failure of the government to enforce its provisions in many instances was the cause of irritation and criticism from industry, labor, and the general public. When the war ended there could no longer be any excuse for the exercise of such extraordinary and unusual powers. Seizure by the government of private property in time of peace in order to settle a civil controversy between industry and labor cannot be justified or defended. The proper remedy for such controversies lies in the enactment, administration, and enforcement of regulatory labor legislation.

Therefore, in the interest of orderly, constitutional processes, and as a gesture of good faith on the part of one whose name was connected with the legislation, I introduced a bill to repeal the Act on the first day that Congress met after the end of the war with Japan. All emergency wartime measures and legislation should be terminated as quickly as possible after the "cease firing" orders on the battle field.

The present wave of labor unrest is the foreseeable and inevitable result of inadequate, one-sided, labor legislation and partial, biased administration. I introduced in the Congress, and the House passed by a vote of two to one, a bill to amend the National Labor Relations Act that would have remedied many of these defects and, in a large measure, have prevented the ominous picture of labor unrest which now threatens the nation.

For the purposes of the present emergency, it is my firm and considered belief that the great bulk of the present difficulty could be very simply solved by amendments to existing labor legislation that would do just two things and no more, namely:

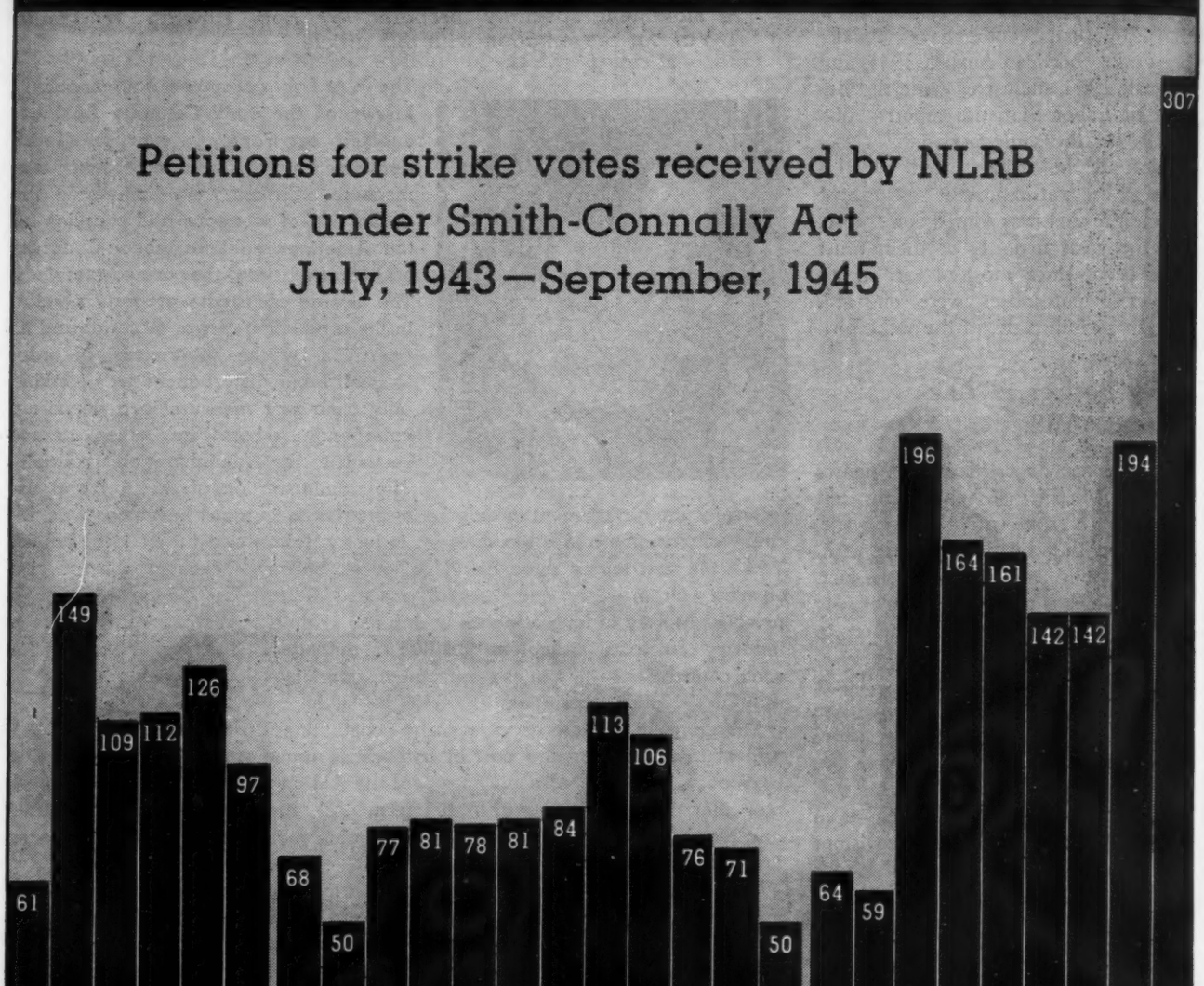
1. Compel labor unions to perform their written contracts with employers to just the same extent as employers are compelled by law to perform their contracts with labor unions.

2. Supplement state laws against violence and intimidation with appropriate federal legislation so that no citizen would be exempt from the penalties for assault and battery, violence, and intimidation, merely because he carried a picketing banner.

No reasonable or honest person can, in good faith, refute the proposition that a written contract between employer and employees should be just as binding and enforceable against one party as against the other. Nor can it be contended that any citizen, however favored his position, should be exempted, on account of his membership in any organization, from the criminal law against assault and battery.

It would seem to be in order for those who object to such legislation to tell the public WHY.

Up Go the Strike Vote Cases



AFL were bitterly opposed to the measure—and officially they still are. FACTORY was assured early in October by spokesmen for both organizations that their executive boards had never reversed the earlier stand in which they denounced the Act as the "anti-labor" work of "union-busters."

In practice, it hasn't hurt the unions a bit and has proved a handy tool for them at times. Even NLRB, which has never been seriously accused of an anti-labor bias, has gone so far as to complain publicly that "labor organizations are making use of the Act to dramatize and focus public attention on their demands and to marshal employee support for the union's position."

An excellent case in point was the General Motors strike vote announcement. Coming unexpectedly, it enabled Vice-President Walter Reuther of the United Auto Workers (CIO) to: (1) Pacify a restive rank and file with a show of action; (2) gain an advantage over his rivals for power within the union; (3) capture the headlines and get attention for UAW's new set of demands.

Beyond that it accomplished nothing. Everyone knows that Reuther can call a strike at any time, vote or no vote. But with the vote in his pocket, he can make the threat of a strike more menacing. And he can use this weapon indefinitely. There is no time limit in the Act. Once workers have voted to strike, it is assumed by the Act that they will remain continuously ready to strike for any length of time thereafter.

Now why is it that labor leaders have been able to maneuver matters to their advantage so freely when the

They Always Vote to Strike

(Record of Smith-Connally strike votes)

YEAR	VOTED TO STRIKE	PER CENT	VOTED NOT TO STRIKE	PER CENT
1943 (5 months)	40,554	68	19,109	32
1944	72,309	72	28,733	28
1945 (9 months)	475,378	84	90,857	16

avowed purpose of the Act—and certainly the clear intent of Congress at the time—was to "outlaw" strikes in wartime? The answer is that the law lacks punitive teeth as far as labor is concerned.

Penalties Fall Only on Management

For management violators of the Act, the law contains teeth in the form of government seizure. But it is extremely vague in providing penalties for violations from the labor side. Unions may be sued for damages, to be sure, but this has hardly seemed worth while. Or they may be punished by the War Labor Board (itself created by the Act), but this agency has seldom seen fit to deal severely with unions and has often been flouted with impunity.

When "wildcat" and other strikes broke out, in fact, the WLB's familiar pattern of behavior was to beseech the strikers to return to work (or sometimes to "demand" that they do so) pending hearings on the dispute. The result was, usually, that the strikers got most of what they wanted in the Board's rulings. And this itself made striking well worth while. Often, too, there were strikes designed solely to force WLB to take action—which is another way in which the Act helped to foster strikes.

If the Smith-Connally Act were to be repealed tomorrow, it would make little difference in the government's over-all authority in labor relations. The President would still have the power—somewhat more limited, to be sure—to seize struck plants under the Second War Powers Act. And he could also use his emergency powers to preserve WLB if, after all, he decides to do so.

In setting up a labor policy, our legislators are going to have to guard against legislating in haste and repenting at leisure. They are going to have to study carefully the Ball-Burton-Hatch Bill and similar proposals for over-all legislation. Time will have to be taken to make sure that all points of view are heard and nothing contradictory or unilateral is included. So repeal of the Smith-Connally Act will not solve the whole labor problem.

But repeal will do one important job that is needed very much right now. It will put an end to the ridiculous strike provisions of the Act and this, taking first things first, is one thing Congress can and must do now. It will be silly if we continue to pay a heavy bill in manpower and money to kid ourselves.

What I See Ahead

Prepared especially for *Factory* by

L. B. SCHWELLENBACH

Secretary of Labor

THOUGH THE PATTERN of our peacetime economy is beginning to emerge with a good deal of clarity, the visible outlines still leave some pressing questions unanswered. Most of them are bread-and-butter questions, concerned with such matters as the number of future jobs and job-seekers, wage rates, hours and working conditions, and prices and profits. In many instances, readjustments are severe. Labor and management, in partnership with government, are applying themselves earnestly to this task. The labor-management conference, called by the President, and which begins on November 5, is an important step in this coordinated effort.

Higher Goals

Several wartime developments are worthy of thought. Most important is the fact that America at war was able to maintain production for civilian needs at record levels and also turn out war materials with an annual value exceeding $60,000,000,000. Moreover, this peak was reached while some 12,000,000 young, able men and women were serving in the armed forces.

In other words, with these millions of potential workers withdrawn from the labor force, the United States was able to superimpose a $60,000,000,000 job of war production on a civilian economy which accounted for consumer goods and services totaling close to $100,000,000,000 yearly.

What sort of post-war living standards does this immense productive potential promise? What does it tell us about the number of jobs that may be available, the probable wage structure, and the general pattern of our peacetime economy?

Certainly it suggests much higher totals than we have ever seen before—much greater production of consumer goods and services, higher living standards, and the mass purchasing power that such standards must rest on. And certainly no general program of belt-tightening and retrenchment is indicated—quite the contrary.

The exact dimensions of a high-production, high-consumption peacetime economy are not easy to determine. A great many forecasts and estimates have been made, including several competent "Reconversion Communiqués" which appeared in recent issues of this magazine.

The Bureau of Labor Statistics, which is the Labor Department's basic fact-finding agency, has recently completed a survey of post-war wage and salary prospects that I should like to cite briefly. There are other yardsticks, but this one, the income of wage and salaried workers, seems particularly apropos to me. As Secretary of Labor, I am under a congressional mandate to promote the welfare of these very groups. Moreover, total payments for wages and salaries account for about two-thirds of the national income.

Table I presents an interesting comparison of the changes that war production and a wartime economy have brought.

Payrolls Tripled

Notice that manufacturing, which paid out about 43 percent of all wages and salaries in 1944, tripled its payments during the 5-year period, far exceeding all other major sources in rates of increase. Estimates for 1945 indicate that prior to V-J Day the pattern and volume of income payments was substantially like 1944.

It is apparent that several of the forces contributing to these wartime totals are apt to reverse themselves in peacetime. Chief among the factors

Table I. Estimated Wage and Salary Income[1]

(By source. In millions)

Source	1944[2]	1943	1942	1941	1940	1939
All sources	$98,131	$92,500	$76,204	$59,528	$48,050	$43,847
Manufacturing	42,448	40,796	30,653	21,503	15,372	13,189
Mining	2,204	2,039	1,835	1,600	1,332	1,178
Contract construction	2,615	3,670	4,644	2,753	1,674	1,550
Transportation and utilities	9,787	8,390	6,961	5,875	5,167	4,913
Trade	12,498	11,347	10,452	9,824	8,404	7,772
Finance, insurance, and real estate	2,948	2,812	2,648	2,508	2,324	2,248
Service[3] and miscellaneous	10,689	9,467	8,551	7,624	6,826	6,402
Agriculture (hired hands)	1,631	1,452	1,177	900	752	738
Government[4]	13,311	12,527	9,283	6,941	6,199	5,857

[1] Data are from U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce. Figures for 1939 to 1943, inclusive, are based on table 14, of National Income and National Product in 1943, in Survey of Current Business, April 1944. BFDC estimates of agricultural wages and salaries have been added, however, and payments to members of the armed forces excluded; the data for "government" for 1942 and 1943 have been revised. The 1944 data represent preliminary figures supplied by courtesy of the BFDC. Revisions of some of the estimates for the years 1939–43 appear in the June, 1945, issue of the Survey of Current Business; these do not affect the conclusions reached in this article, however, and have not been taken into account.

[2] Preliminary.

[3] Includes domestic service.

[4] Excludes work-relief wages and all payments to the armed forces.

in Labor Relations

Press Association

Secretary of Labor Schwellenbach (center) here lays plans for labor-management conferences with (left to right): Eric Johnston, U. S. Chamber of Commerce; Ira Mosher, National Association of Manufacturers; Secretary of Commerce Henry Wallace; Reconversion Director John Snyder; William Green, American Federation of Labor, and Philip Murray, Congress of Industrial Organizations

making for a reduction are: A shorter work week; the return to a peacetime pattern of employment; a drop in the rate of output by incentive workers, due to shorter runs of individual products; fewer opportunities for pay supplements such as work-shift differentials and the like.

Resumption of the 40-hour week, with overtime largely eliminated, will reduce wage-salary income by about $13,000,000,000, assuming that employment and wage rates remain the same. The shift of employment away from the relatively high-paid war industries back to the lower-paid "consumer industries" will cut off some $5,600,000,000 more, and premium payments for late-shift work are expected to drop in the neighborhood of $500,000,000.

After allowing for some duplication, the Bureau of Labor Statistics sets the combined effect of these three factors at $16,700,000,000. Put another way, this means an average yearly loss of almost $400 per worker. Like all averages this figure masks the much more drastic reductions which large groups of workers are experiencing even when they can avoid an interval of unemployment.

All of these estimates deal only with civilian employment and they assume no post-war change in either the volume of employment or wage rates. Actually, however, there is good reason to suppose that there will be more people in the civilian labor market than during 1944—the 1946-47 total may be up four or five million. If we assume that the civilian labor force will number 57,500,000 and allow 2,000,000 for "frictional unemployment,"* a

* "Frictional unemployment" refers to the temporary joblessness caused by workers changing from job to job and from city to city.

Table II. Estimated Annual Wage-Salary Income[1]

(In 1944 and in post-war period, assuming continuation of 1944 wage rates, by major industry group. In millions)

Major industry group	1944 [2]	Post-war period [3]		
		Assuming full employment	Assuming medium employment	Assuming low employment
Total wage-salary income	**$98,131**	**$87,441**	**$75,992**	**$64,574**
Manufacturing, total	**42,448**	**28,029**	**23,156**	**19,090**
Salaried workers, total	9,537	7,479	6,561	5,092
Wage earners, total	32,911	20,550	16,595	13,998
Iron and steel	4,595	3,282	2,462	1,942
Electrical equipment	1,894	844	713	486
Machinery (except electrical)	3,516	2,013	1,623	1,087
Transportation equipment (except automobiles)	7,112	717	605	356
Automobiles	2,190	1,455	1,150	879
Non-Ferrous metals and their products	1,038	645	411	448
Lumber and timber basic products	784	998	787	636
Furniture and finished lumber products	667	726	571	507
Stone, clay, and glass products	688	736	556	498
Textile-mill products	1,801	1,905	1,576	1,510
Apparel and other finished textile products	1,283	1,490	1,236	1,137
Leather and leather products	553	669	545	514
Food and kindred products	1,965	1,549	1,485	1,365
Tobacco manufactures	132	136	109	118
Paper and allied products	653	617	522	419
Printing and publishing	777	797	671	677
Chemicals and allied products	1,422	752	555	516
Products of petroleum and coal	388	330	264	224
Rubber products	527	350	288	242
Miscellaneous industries	925	538	467	438
Non-Manufacturing, total	**38,983**	**46,724**	**39,667**	**33,329**
Mining	2,204	2,011	1,575	1,415
Contract construction	2,615	7,613	4,852	3,673
Transportation and public utilities	9,787	8,407	7,857	6,069
Trade	12,498	14,559	12,243	10,789
Finance, insurance, and real estate	2,948	3,415	3,312	2,807
Service (except domestic) and miscellanous	8,931	10,721	9,827	8,576
Domestic service	**1,758**	**1,964**	**2,357**	**2,160**
Agriculture (hired hands)	**1,631**	**2,038**	**2,127**	**2,216**
Government	**13,311**	**8,685**	**8,685**	**7,779**

[1] Excludes payments to members of the armed forces.

[2] The 1944 classification of establishments, like that for the post-war period, is based on peacetime production; e.g., wages and salaries shown for the automobile industry are those paid by establishments that were manufacturing automobiles in 1939.

[3] Under full and medium employment it is assumed that the 40-hour week prevails, with actual hours of work averaging 38. Under low employment actual hours of work are assumed to be the same as the averages in 1939.

figure of 55,500,000 would represent full employment—with about 45,500,000 working for wages and salaries.

The last figure exceeds the 1944 total of wage and salary workers by some 3,000,000. This increase in the number of workers would tend to offset some of the income decreases resulting from the causes I have listed. However, the actual volume of employment that we can expect cannot be predicted. So the next table which I want to present deals with three possibilities or sets of conditions.

The first (see Table II) is full employment as given above. The second is called "medium employment" and presupposes 5,500,000 jobless in addition to a pool of 2,000,000 frictional unemployed. The third possibility assumes a condition of "low employment" with 12,500,000 hunting work, including "floaters" who are in the process of changing jobs.

Whether or not these estimates cover the full range of post-war contingencies, they do underscore the controlling significance of employment levels and wage rates in our post-war economy. Moreover, the range of possibilities is not merely a statistical concept; already it is taking shape as a grim economic reality to millions of workers and their families.

In focusing attention on wage-salary payments I have not forgotten the other elements that make up the total national income or the forces that influence them. Historically, however, the share of the national income going to the payment of wages and salaries has been fairly stable—around 60 percent, except for depression and war years. I know, too, that our economy is closely integrated, its component parts all fed from the same blood stream.

Economic Backdrop

Figures (see Table III) showing the total national income and its distribution among major groups during the period from 1929 through 1944 make this very clear.

There is, of course, nothing secret or mysterious about the data which I have presented. Both management and labor are familiar with these or similar figures.

So it is quite natural to find these various over-all estimates appearing as a sort of economic backdrop for most of the industrial relations problems we face today.

To me this is one of the most significant aspects of the whole labor-management scene. It raises far-reaching questions of policy for government too. And because it does introduce a new series of imponderables, woven into a mosaic of fact and prediction, this economic backdrop has not simplified the task of those who seek to promote a better understanding in the relationship between employers and employees.

Nevertheless, I see no reason why honest differences over the relative accuracy of various full-employment estimates should be permitted to sidetrack the real objective—an economic climate in which all who are able and willing to work can find jobs under satisfactory conditions. By definition this excludes abnormally long hours, sweat shop wages, or pressure to make people take a job who do not have the inclination, or to make them work for an employer rather than work for themselves.

Nor do I see any reason why differences over what constitutes the maximum amount of goods and serv-

ices that we can produce and distribute should block our efforts to attain such a goal. I do not know how much of that $60,000,000,000 war potential can be swung back into peacetime production. I do not pretend to know exactly how much the work of returned veterans will enhance our output of civilian goods and services.

Record Production

I decline to split hairs (or billions) in such a debate. But I do know that all of these factors point in one direction—record civilian production and consumption. This, of course, demands greater mass purchasing power, whether it is expressed as increased wages and salaries, or lower prices, or a combination of both.

I cannot predict the exact magnitude of our national income a year hence, but I do know that an optimum figure will preclude the payment of substandard wages or salaries to any considerable group within our economy. That is one reason why I strongly endorse congressional proposals to raise the minimum wage under the Fair Labor Standards Act to 65 cents.

We are learning that wages must be viewed not only as labor costs but also as an index of our purchasing power. Experience with this Federal Wage and Hour Law has also shown that a floor under wages actually assists our system of free competitive enterprise in working out its true function. The wage-cut, price-cut cycle seldom leads to more efficient production. On the contrary, the tendency is all the other way where employers and supervisors seek to substitute "cheap labor" for managerial know-how. Just as our law makes monopoly an illegal means of stifling competition, so our law should rule out the payment of substandard wages which cause unfair competition.

We are learning, too, the heavy cost of mass unemployment—it has been the great national extravagance. As Secretary of Labor I have urged that the federal government formally recognize the need for full employment if our system of private enterprise is to be safeguarded amid the stress of intricate post-war problems, in a world where many nations will seek rigid control of their economies.

It was only when war came that we attained full employment in this country. In fact, we attained over-employment. We recruited millions of new workers into the labor market, even including children. We extended the hours of employment and became indifferent to the problems of fatigue and over-exhaustion. We did all this to win a war. We dare not let victory usher in a period of large-scale underemployment.

Table III. National Income Payments, Selected Years

(By type of payment. In millions of dollars)

	1929	1933	1939	1940	1941	1942	1943	1944
Wages and salaries[1]	52,436	28,566	43,850	47,995	59,943	77,948	95,981	100,567
Proprietors' income[2]	13,816	6,632	10,973	11,848	15,784	20,372	23,099	23,192
Property income[3]	15,286	8,728	11,023	11,335	12,283	12,790	13,973	15,058
Other income[4]	1,079	2,347	4,755	4,674	4,259	4,191	5,801	9,273
Total[5]	82,617	46,273	70,601	75,852	92,269	115,301	138,854	148,090

[1] Includes only payments to residents of the continental United States; excludes, therefore, pay of armed forces and federal civilian employees stationed outside the country.

[2] After deduction of employees' contributions to Social Security, Railroad Retirement, Railroad Unemployment Insurance, and government retirement programs. Pay of the armed forces, net of contributions to family-allowance payments and of voluntary allotments of pay to individuals, is allocated by states in terms of the state of duty.

[3] Represents net income of unincorporated businesses, including farms, before owners' withdrawals.

[4] Includes dividends, interest, and net rents and royalties.

[5] Includes direct relief, work relief; labor income items such as pensions, compensation for injuries, and social insurance benefits; mustering-out payments to veterans (in 1944); and (in 1942–44) family-allowance payments and voluntary allotments to dependents of military personnel (allocated to state of dependents' residence).

Source: U. S. Department of Commerce.

At first glance most of the foregoing may seem to have little connection with the title of this article. Yet every one of these subjects helps condition our economic and social thinking, helps create a climate of opinion that is often controlling. And because industrial relations do not take place in a vacuum, neither the representatives of management nor the representatives of labor are immune to the hopes and fears, the prejudices and principles, of people around them.

Department's Mandate

We in the Department of Labor have a mandate from Congress to "foster, promote, and develop the welfare of the wage earners of the United States, to improve their working conditions, and to advance their opportunities for profitable employment." To accomplish this during the readjustment period requires an understanding by everyone of the basic causes that result in industrial strife. Industrial strife is an ugly thing. It is costly to labor, to industry, and to the public. More and more its effects reach beyond the direct participants out into the complicated structure of commerce and industry.

When management and labor are deadlocked, it is not enough for the remainder of us to become indignant about it and try to fix the blame on either side. What all of us must do, is find out why such strife exists and try to eliminate the causes of it. We cannot do this if we ignore the basic facts of our economy or try to reverse the trends that develop in our dynamic, freedom-loving society.

Warns Extremists

To extremists in both camps I would sound a note of solemn warning. If in this period of strain and anxiety either group seeks to gain an unfair advantage, the court of public opinion will not be slow to pass judgment and call for action. It would, for example, be an act of incredible folly for any group of employers to attempt to discard collective bargaining. And extreme demands by any labor group—demands that allowed opponents to fasten the Red label upon organized labor—could be equally disastrous. In either case the result would be a long period of bitter, futile industrial strife.

I look to the sober, responsible leadership of labor and management to find a safer, more constructive course in the President's conference which is in session in Washington as this article is published.

As Secretary of Labor, I desire to underscore the fact that this conference belongs to the 36 representatives of labor and management who are taking part in it. They are men of good will who believe that they represent people of good will, interested in the protection and preservation of our democracy at a time when democracy needs the help of all true believers in it.

Built-In Pallets Cut Scrap-Handling Time

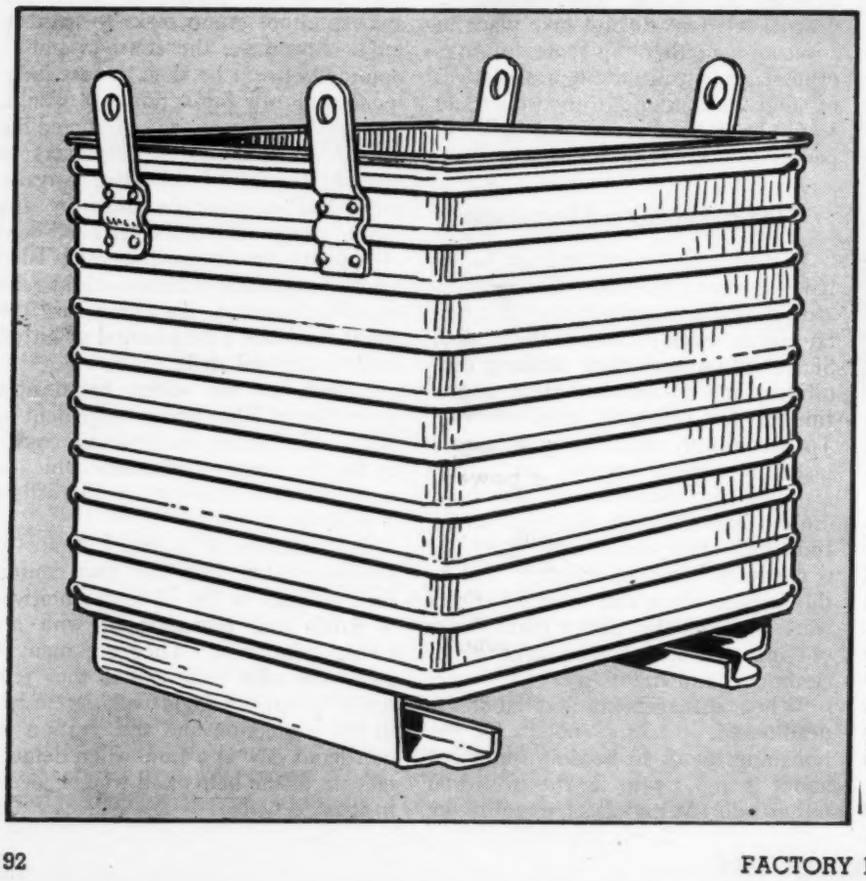
FORREST MacDONALD, Supervisor of Salvage, Supercharger Plant, Allis-Chalmers Manufacturing Company, Milwaukee

BINS WITH BUILT-IN PALLETS are used in combination with fork trucks to provide the answer to the scrap handling problem at the Allis-Chalmers supercharger plant. More than 450 of the bins are currently in operation. In a normal month approximately 475,000 pounds of processed steel and aluminum turnings and some 300,000 pounds of solid scrap are handled.

No direct comparison with other scrap handling methods is possible since the method now in use has been employed ever since the plant was opened in 1942. The company is sure, however, that it compares favorably with procedures in other plants of the corporation.

Bins are tiered until there is enough scrap to make a shipment

Below. Twin steel pallets, 5 inches wide and 4 inches deep, are welded to the bottom of the bin. They provide a base for the bins as well as sleeves into which power truck forks may be thrust



The accompanying sketch shows the steel bin that is being used. Two steel pallets have been welded to the bottom of the bin to form a base as well as sleeves into which the forks of a power truck may be thrust. These pallets are 5 inches wide, 4 deep.

Bins are moved by means of power trucks that have been equipped with

So-called solid scrap (other than processed steel and aluminum turnings) is also handled in shop bins equipped with built-in pallets. Swivel-mounted forks on power truck permit easy dumping

swivel-mounted forks. Trucks are thus able to pick up fully loaded bins, transport them from storage area to loading platforms, and dump the contents into trailer truck bodies or railroad cars. The sleeve-like pallets make this dumping operation possible, since the bins may be turned upside down and still remain on the truck forks.

Bins are filled with chips and turnings which have been crushed and placed in a centrifuge in order to remove the cutting oil, or with larger pieces of scrap—so-called "solid" scrap —which are shipped uncrushed. Bins weigh 180 pounds when filled with aluminum chips, up to 5000 pounds when loaded with forging scrap.

One big advantage of this scrap handling method is that the loaded bins may be tiered five high and stored until sufficient scrap has been accumulated for shipment.

Loading a 10-ton trailer with aluminum chips takes 2½ hours by this method. Three men are needed—a leveler and two truckdrivers. It should be explained that in loading trailers it is necessary to move the bins more than 250 feet from the storage area to the shipping platform. On the other hand, time for loading 140,000 pounds of steel trimmings into a railroad car is only 4 hours because the car may be spotted at the storage area. A truckdriver and a leveler do this job.

One-Girl System Provides Perpetual Inventory

E. N. REYNOLDS, Production Control Manager, Federal Manufacturing & Engineering Corporation, Brooklyn

CURRENT STATUS of some 4000 items is provided by a perpetual inventory system set up at Federal Manufacturing & Engineering Corporation. The method is characterized by speed and simplicity. It can be readily expanded. One girl does the work.

The thinking behind the previous stock control was simply to make it provide the kind of auditing needed for payment of bills, preparation of financial statements, and similar functions. Indirectly, this earlier system was adapted, of course, to show production executives where parts and materials could be found. But the system's relation to production was secondary.

The old methods were effective enough for accounting requirements, because it is not usually important for an accounting department to get *immediate* notification of the income and outgo of materials and parts from the stockroom.

With an increasing rate of turnover in stocks, however, production men needed a system that would show the current status of the stockroom at all times. They needed to be certain whenever they gave a go-ahead order for production that they would not encounter a shortage of some part or material through lack of prompt stockroom information. And, for convenience, they needed a system that would show the stockroom's status in visual form.

The problem was solved to the satisfaction of both the production department and the accounting department by the introduction of the present system of perpetual inventory control which shows any changes in stockroom supplies within a matter of minutes. In addition, the company has found it possible to operate this control of thousands of items with the services of only one clerk.

The same simplicity that reduced the amount of labor required to operate the new system also makes it pos-

Up-to-date records of parts and materials on hand and on order are easily maintained at Federal by keeping them in numerical order in four cabinets. Only one clerk is needed to operate the system

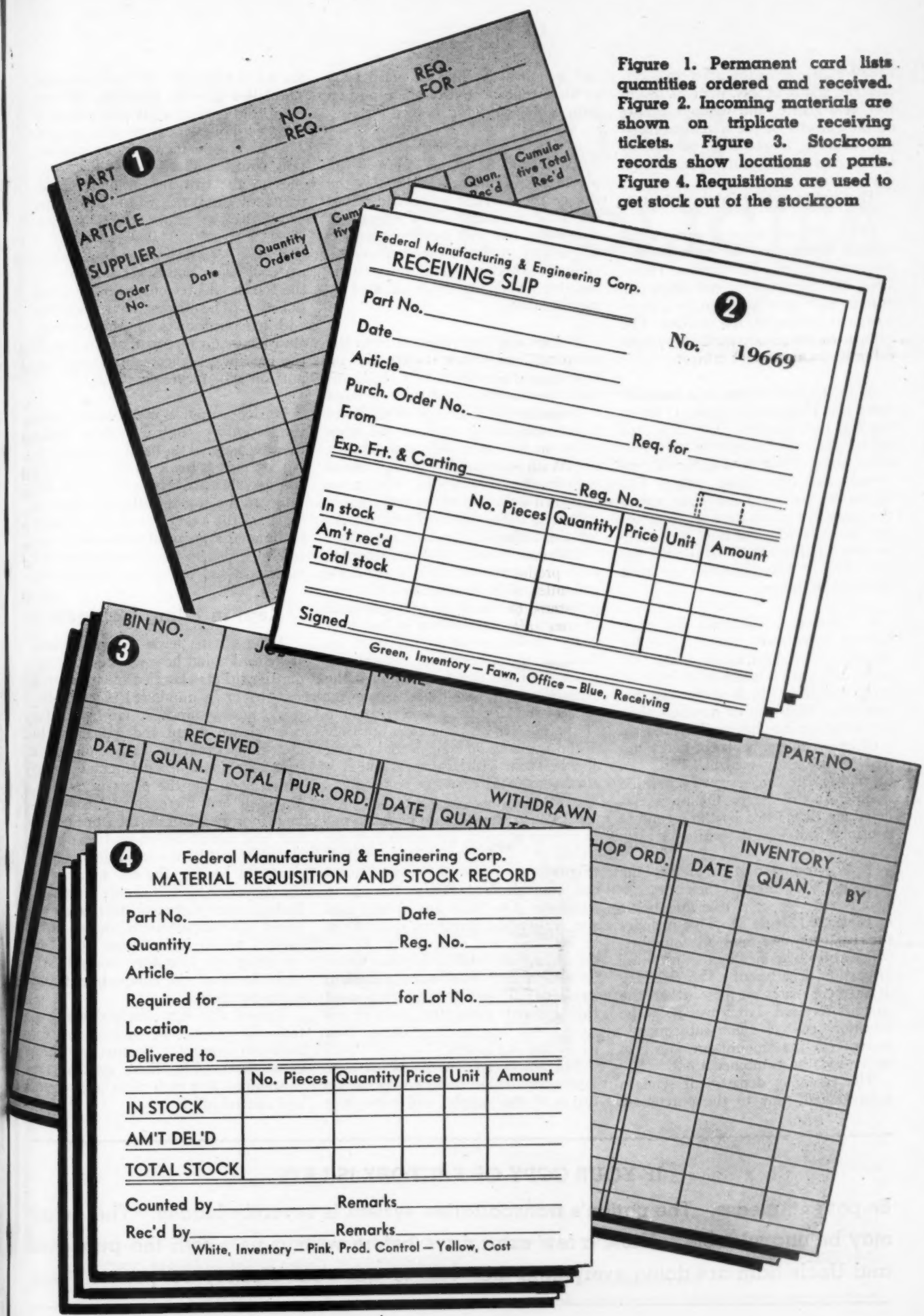


Figure 1. Permanent card lists quantities ordered and received. Figure 2. Incoming materials are shown on triplicate receiving tickets. Figure 3. Stockroom records show locations of parts. Figure 4. Requisitions are used to get stock out of the stockroom

sible for anyone in the office to ascertain the status of any item in inventory at a glance, and without calling on the operator of the system to interpret it. Also, it would be possible to train a new or substitute operator in a day or two.

The system works in this manner:

1. Each classification of parts or materials, in addition to its own part number, is given a file number. Thereafter, the inventory control office records of each part are kept in a compartment bearing its file number. The compartments are arranged in numerical order in a compact cabinet.

2. First record placed in a compartment is a white card (Figure 1) showing the part number. On this card are recorded the quantity of each purchase order, subsequent quantities received, and cumulative totals. The figures on this card therefore reflect the quantity of each item on order but not yet delivered, and thus are an important supplement to additional figures showing the quantities on hand in the stockroom.

3. Thereafter, whenever the engineering department makes up a list of parts required for a new production order, reference is made to an index of parts numbers which shows the file numbers. Both sets of numbers then are listed on purchase orders and on production orders, copies of which are sent to inventory control. Parts not previously listed are assigned a new file number at this stage. Quantities ordered are then listed by the inventory control operator on the white file card.

4. When materials come into the receiving department, their description is entered on a receiving ticket in triplicate (Figure 2). This includes the part number and file number, which also are verified by the incoming inspection department. The receiving department marks on these tickets the amount received, but leaves it to the inventory control office subsequently to write in the amount previously in stock, and the combined total.

The receiving department sends a fawn-colored copy to the purchasing and accounting offices, a green copy to the inventory control office, and retains a blue copy for its own file.

5. The blue copy then is used as a check when the goods received are placed in a numbered location in the storage room. Here a separate record file kept on large cards (Figure 3) shows the bin and location numbers of parts in storage, amounts received, amounts withdrawn, and amounts remaining. The large cards are filed by part numbers.

6. When the green ticket from the receiving department reaches the inventory control office—in a matter of minutes—the amount of stock on hand is found on the top copy of whatever tickets are already filed in the compartment file under their common file number. The amount of stock on hand is then copied onto the new green ticket, and is added to the new amount received. The combined total is written also at the foot of the green ticket.

The green ticket becomes a permanent part of the inventory control file and is placed in its numbered file compartment on top of all previous cards or tickets. It stays on top as long as it is the newest record of the stock on hand in the stockroom. Subsequent green receiving tickets go through the same process. Each time, the newest total of stock on hand appears on top of the file. In this manner, not only is the figure given quickly but it can also be taken with assurance that it is always up to date.

7. When stocks are to be taken out of storage to go to the production department, a different set of tickets (Figure 4) is made out in the inventory control office. These also are in triplicate. On them are written part and registration numbers, quantity to be delivered, and destination. At the same time, the control operator writes on these tickets the amount of stock to be delivered, and the subtraction of this amount from the amount on hand. All three of these copies then go to the stockroom.

The stockkeeper refers to his large card record of locations, enters the location of the supply, and turns over the set of tickets to the stock selecter. The latter gets the materials, delivers them, and gets an acknowledgment of their receipt signed on the tickets. The pink copy then goes to production control office, the yellow copy goes to the cost and accounting department, and the white copy goes back to the inventory control section.

8. The returned white copy of the material requisition ticket is placed on the top of all previous green or white tickets. (The newest ticket, whether a white requisition or a green receiving, always goes on top, so that the top of the file always reflects the newest report on the stockroom status.)

No requisition is ever issued unless the inventory control system shows there is material on hand to supply it. No attempt is made in the inventory control office to keep a record of the value of the stocks, although there is space on the tickets by which this can be done as a financial accounting procedure—either in the inventory control office or in the accounting department.

Kept in Filing Cabinets

Although the basic system as used at Federal could be operated by keeping the tickets classified on numbered spindles or in numbered pigeonholes, this company finds it far better for convenience, safety, and appearance to use filing cabinets, each holding a dozen or more hinged metal leaves which open like the pages of a book. On each leaf there are 30 compartments for files, half on the front of the leaf, and the others on its back. Each compartment has an individual spring-wire clip bearing the file number of the tickets which it holds in place. Federal uses three cabinets, each of about 500 compartments, and a fourth cabinet which holds about 1000, in operating its inventory control system. Some of the compartments are multi-numbered.

Federal also uses closely similar systems for production control and for toolroom control. Because of their close relationship, these systems are maintained near each other in the general control office.

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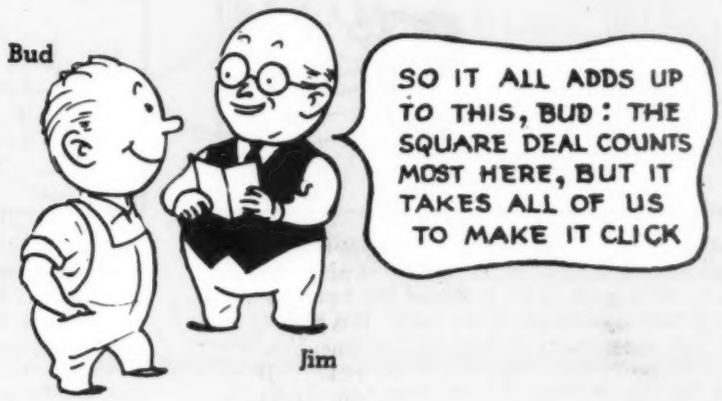
DRAMATIZING PERSONNEL POLICIES



"JIM SEZ" is the title of an 8x10-in. spiral-bound booklet prepared by The Paraffine Companies, Inc., San Francisco, and distributed to employees in the interest of acquainting them with the corporation's personnel policies . . . Jim is a veteran foreman, who obviously knows he is a part of management. Bud is a newcomer who is going to work with Jim. Jim takes Bud for stroll through the plant to show him how company policies work. Jim sez what's in his heart and mind. Bud adds comment to show he understands . . . Subjects covered are wages, hours, working conditions, safety measures, promotions, discharges, transfers, lay-offs, and all the other things that are on the new worker's mind . . . Since the technique is one that any industrial plant may use with profit, FACTORY here reproduces 35 of the 50-odd pages in the booklet, most of them about one-quarter of the original size. For easy reading Jim's and Bud's conversations have been lifted from the illustrations and placed underneath them

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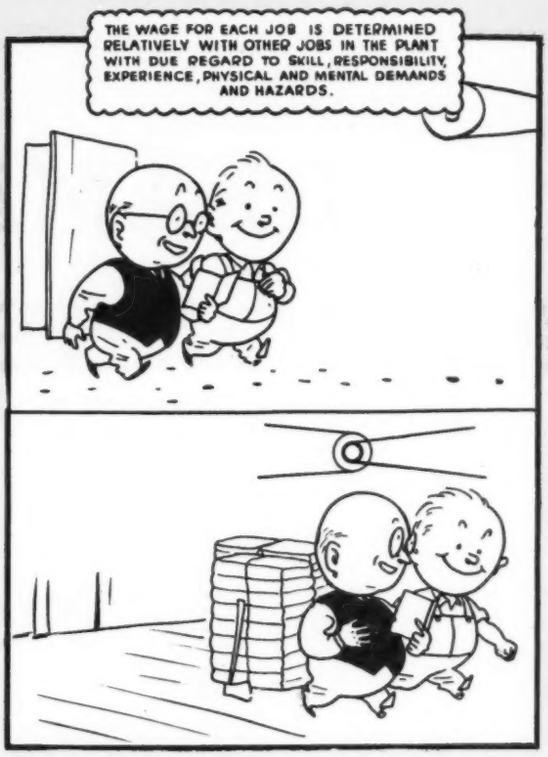
WAGES
OUR WAGES ARE GENERALLY EQUAL TO OR ABOVE THE WAGE LEVEL FOR SIMILAR WORK AND CONDITIONS IN THE LOCALITY AND INDUSTRY.

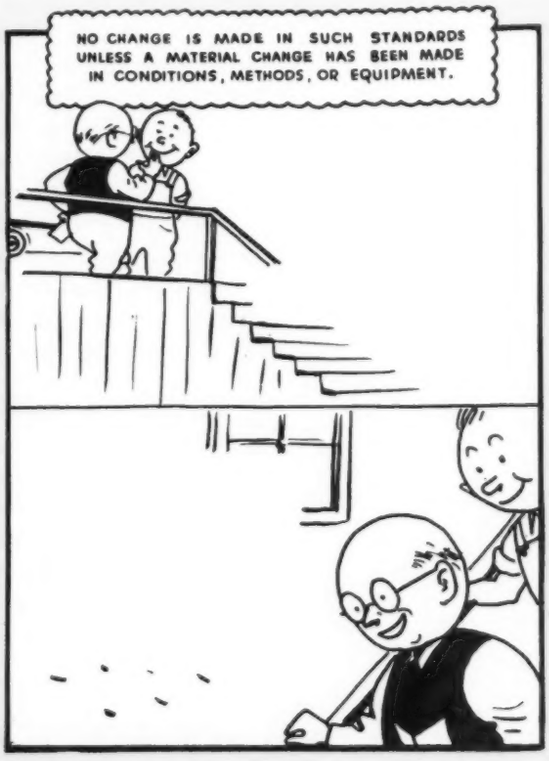
JIM SEZ: "Our wages are high. You know what that'll mean to your family!" **BUD ADDS:** "I get it. Means my family is going to eat more and live better because I'm getting more dough. That's swell." **JIM SEZ:** "Paying high wages means we have the best men. We have a swell crew. They're superior. We're proud of them and they like it here. The best men naturally do the best work"


THE WAGE FOR EACH JOB IS DETERMINED RELATIVELY WITH OTHER JOBS IN THE PLANT WITH DUE REGARD TO SKILL, RESPONSIBILITY, EXPERIENCE, PHYSICAL AND MENTAL DEMANDS AND HAZARDS.

JIM SEZ: "Wages for each job is figgered out by comparing its importance with other jobs." **BUD ADDS:** "If I have a harder job than my partner, I get more money for it. I like that. That's fair." **JIM SEZ:** "Sure. For some jobs you'll have to study on your own time. That's an investment of time and money. It's right that you get more money for those jobs." **BUD ADDS:** "That's the way I feel about it, too"

PERFORMANCE
FAIR STANDARDS OF PERFORMANCE AND PRODUCTION WHICH CAN BE REASONABLY AND CONSISTENTLY ATTAINED ARE USED.

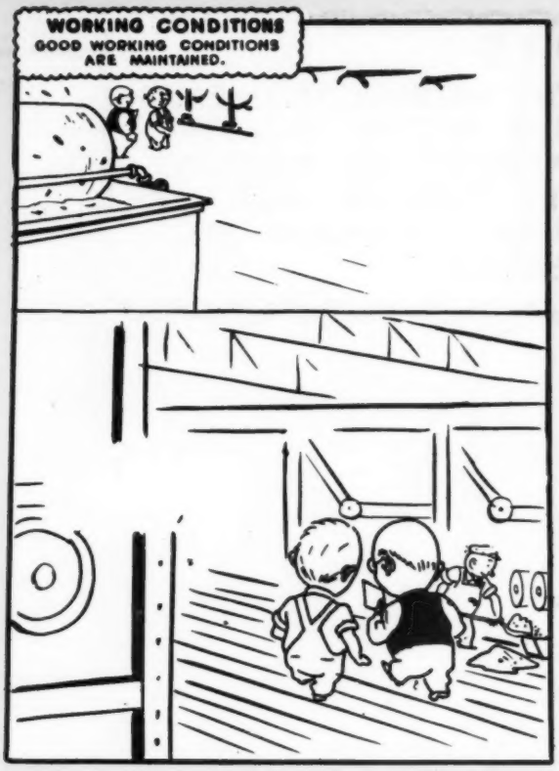
JIM SEZ: "Pabco's production standards are fair." **BUD ADDS:** "Fair enough. I know exactly what the company is going to pay me. So the company ought to know what they're gettin' from me." **JIM SEZ:** "Production standards help us figger costs. We got to know what it costs to make the goods. Otherwise we wouldn't know what prices to charge. Then things would be a mess"



JIM SEZ: "We only change the work standards when conditions change in the way the work is done." **BUD ADDS:** "Gosh! I can hardly believe it. No speed-up." **JIM SEZ:** "Absolutely no! No speed-up. By the way, speed-up is an expression that's a little misused anyway. Sometimes work is made easier and more production is turned out, but you can't call that speed-up"

HOURS
FULL CONSISTENCY WITH THE WELFARE AND HEALTH OF EMPLOYEES IS A MAJOR FACTOR IN ESTABLISHING A GENERAL STANDARD OF WORKING HOURS, CONSIDERING THE TYPE OF WORK AND PROVIDING FOR SEVERAL DEMANDS OR EMERGENCIES.

JIM SEZ: "The health and welfare of our folks is considered in settin' our hours." BUD ADDS: "You regard folks working here as people and not just as cogs in a machine, huh, Jim?" JIM SEZ: "We always remember our folks as human beings . . . that they is people . . . who eat bread and drink coffee . . . live in houses . . . have families . . . drive automobiles . . . work, live, and play. Maybe we remember this so well, because all of our big shots started at the bottom like you—and like me"

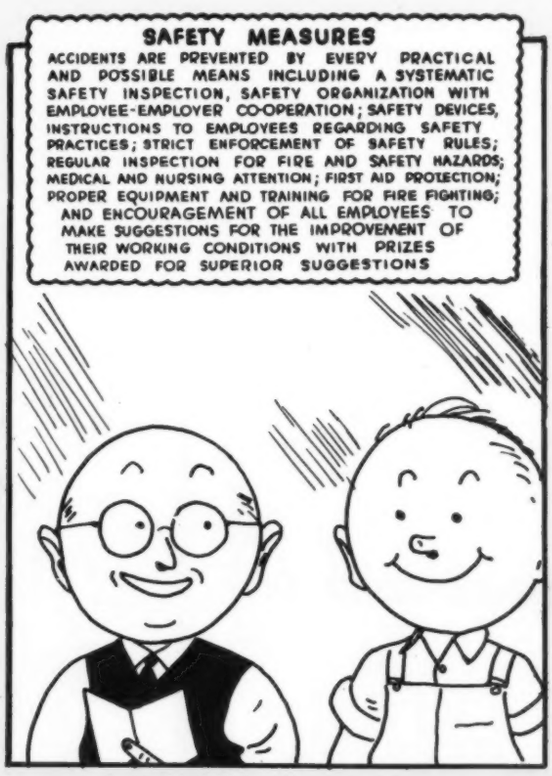


JIM SEZ: "We got swell workin' conditions." **BUD ADDS:** "You don't just make a promise about improved workin' conditions – then forget about it, do you"? **JIM SEZ:** "Heck, no! We keep conditions good and always look out for places to make more improvements"

JIM SEZ: "Our folks mean a lot to us. That's why we're anxious for their self-respect. Our folks are superior, and are the most important thing in the world to us. Just cost ain't the basis of figgerin'. All the money available for such purposes is used. Also, here is a grand chance for our people to make a policy work—by keepin' their locker rooms clean and neat. Remember that, Bud"

PERSONAL CONVENIENCES WHICH APPEAL TO THE SELF RESPECT OF EMPLOYEES - PROPER LIGHTING, VENTILATION, AND WORK ROOM TEMPERATURES; HIGH STANDARDS OF ORDERLINESS AND CLEANLINESS INCLUDING SHOWER AND LOCKER ROOM FACILITIES ARE INCLUDED.

JIM SEZ: "Showers and locker rooms and personal conveniences that make you feel superior—make you feel on top of the world—is our style." **BUD ADDS:** "Consideration of that sort sure makes a fellow feel he means something to a company. Must cost a heap, too"

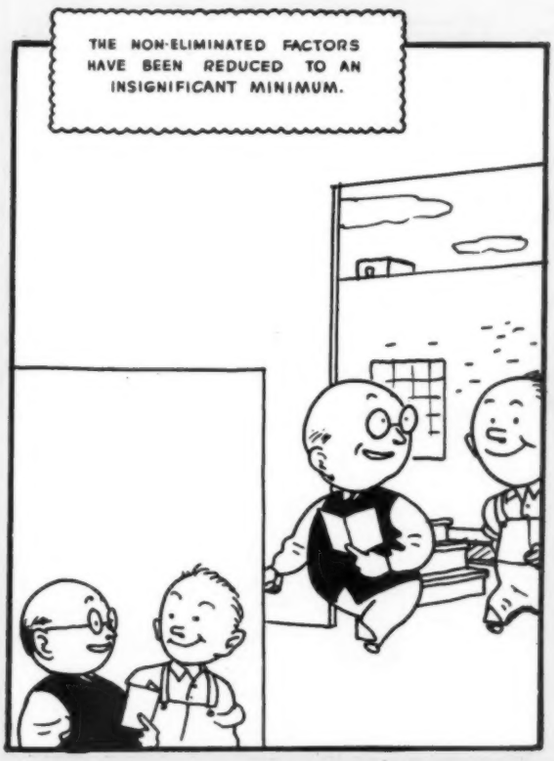

SAFETY MEASURES
ACCIDENTS ARE PREVENTED BY EVERY PRACTICAL AND POSSIBLE MEANS INCLUDING A SYSTEMATIC SAFETY INSPECTION, SAFETY ORGANIZATION WITH EMPLOYEE-EMPLOYER CO-OPERATION; SAFETY DEVICES, INSTRUCTIONS TO EMPLOYEES REGARDING SAFETY PRACTICES; STRICT ENFORCEMENT OF SAFETY RULES; REGULAR INSPECTION FOR FIRE AND SAFETY HAZARDS; MEDICAL AND NURSING ATTENTION; FIRST AID PROTECTION; PROPER EQUIPMENT AND TRAINING FOR FIRE FIGHTING; AND ENCOURAGEMENT OF ALL EMPLOYEES TO MAKE SUGGESTIONS FOR THE IMPROVEMENT OF THEIR WORKING CONDITIONS WITH PRIZES AWARDED FOR SUPERIOR SUGGESTIONS

JIM SEZ: "Accident prevention is a science here"

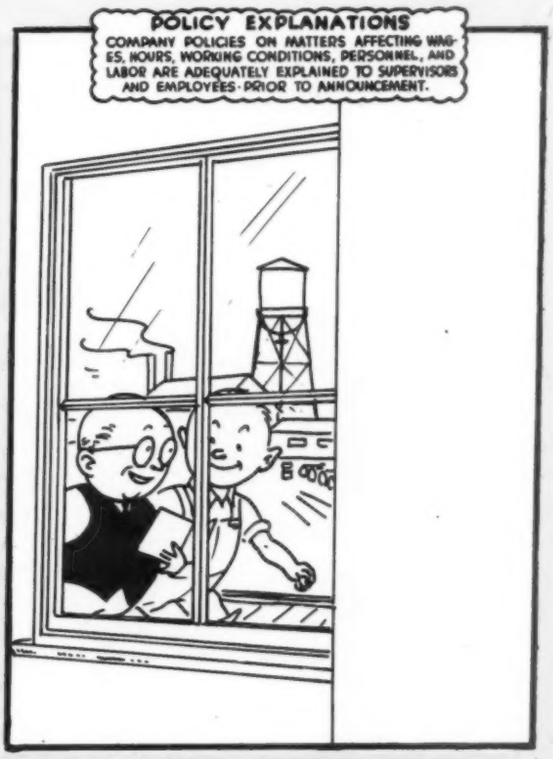
BUD ADDS: "Taking good care of a fellow's safety is mighty important to him and to his family. You need two good arms and legs to keep on working and earn a livin'!" **JIM SEZ:** "In our system, every fellow helps himself and his co-workers make the best working conditions possible"

OCCUPATIONAL DISEASES INHERENT IN WORKING MATERIALS OR PROCESSES ARE CONTROLLED AND SAFEGUARDED SO THAT EMPLOYEES INSOFAR AS POSSIBLE ARE PROTECTED FROM ANY INJURIOUS SUBSTANCES OR CONDITIONS WHICH CANNOT BE ELIMINATED.

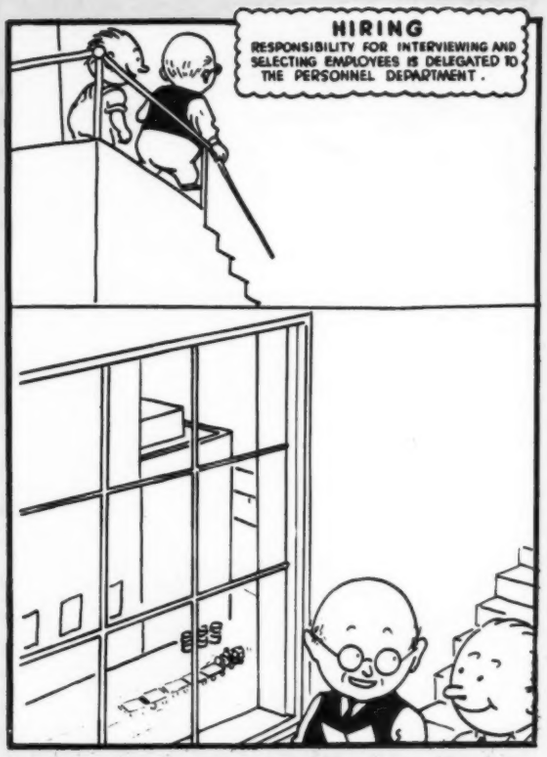
JIM SEZ: "Our folks are protected from occupational diseases." **BUD ADDS:** "Pabco certainly tries hard to care for its folks." **JIM SEZ:** "Our men and women are our most valuable asset, so we care for them like other folks care for diamonds or a shiny, new automobile"



JIM SEZ: "Danger spots are about zero." **BUD ADDS:** "I'll bet it takes plenty of sugar to put in all those safety devices." **JIM SEZ:** "It does. But we believe it's well worth spending thousands of dollars to protect the health and safety of our folks. And we'll go on spendin' and addin' as we learn more needs"


POLICY EXPLANATIONS
COMPANY POLICIES ON MATTERS AFFECTING WAGES, HOURS, WORKING CONDITIONS, PERSONNEL, AND LABOR ARE ADEQUATELY EXPLAINED TO SUPERVISORS AND EMPLOYEES PRIOR TO ANNOUNCEMENT.

JIM SEZ: "All policies are talked over with the boys before the home office sends them out." **BUD ADDS:** "Gee! You take all of us right into the company's confidence." **JIM SEZ:** "Why not? We're in business together. You're a partner with the rest of us. You're entitled to know what's going on"

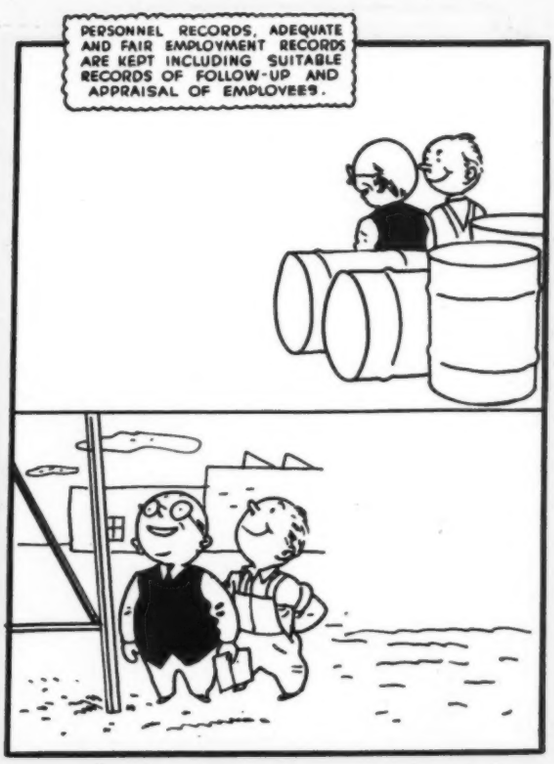


JIM SEZ: "The personnel department interviews and selects the workers." **BUD ADDS:** "Then a foreman or superintendent can't just round up his friends and put them to work." **JIM SEZ:** "No, sirree. The best man for the job—regardless of his friends or connections—that's the fellow we want. When a call comes, the personnel department gets out the specifications for the job and picks the man or woman who best fit them"

JIM SEZ: "Final choice of new workers is made by the department head." **BUD ADDS:** "After the personnel department has done the selecting?" **JIM SEZ:** "That's right. Final choice has to be in the hands of the man you're going to work for. He's the man you've got to please"

PREFERENCE IN HIRING IS SHOWN TO FORMER EMPLOYEES WITH CONSIDERATION TO ABILITY, ATTITUDE, MERIT, AND LENGTH OF PREVIOUS SERVICE.

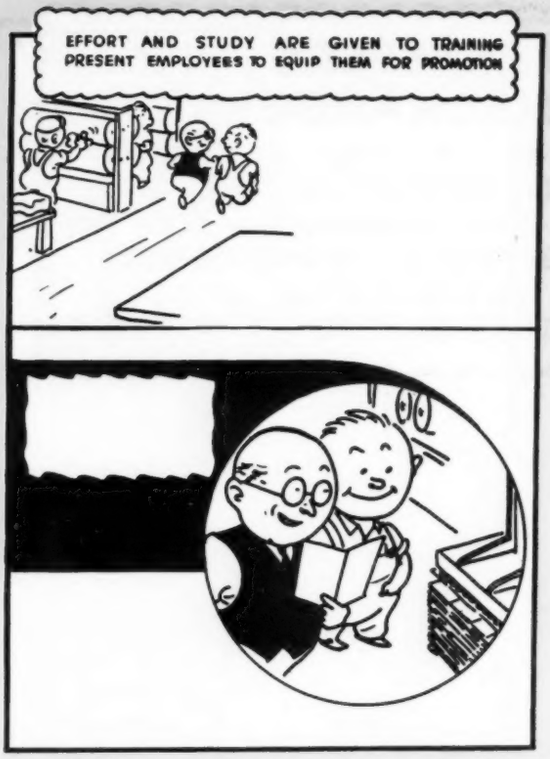
JIM SEZ: "In hiring we give all the breaks we can to former workers." **BUD ADDS:** "You sort of build up family ties with the company here." **JIM SEZ:** "Other pastures always look greener. Lots of folks have to find out for themselves that ain't always so. We found so many men and women waiting to come back, we made their easy return a policy"


PERSONNEL RECORDS, ADEQUATE AND FAIR EMPLOYMENT RECORDS ARE KEPT INCLUDING SUITABLE RECORDS OF FOLLOW-UP AND APPRAISAL OF EMPLOYEES.

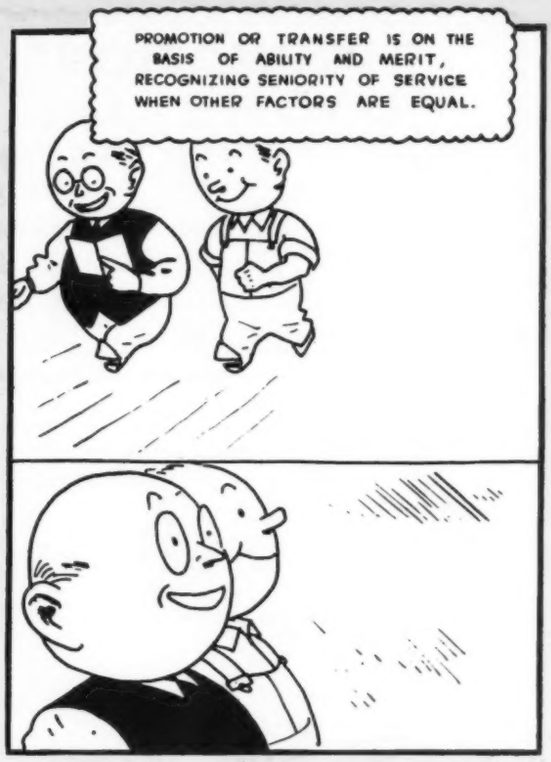
JIM SEZ: "Full personnel and employment records are kept." **BUD ADDS:** "I figure personnel records was always kept as snoop records—like the police mugging and finger-printing somebody." **JIM SEZ:** "No, sirree!! Personnel records are needed. We got to have all that information—and we don't want any more than's needed—for social security, insurance, seniority, promotion, the medical department, unions, etc. etc."

PROMOTIONS, TRANSFERS, LAYOFFS, AND DISCHARGES
VERSATILITY AND FLEXIBILITY IN THE WORKING FORCES ARE BUILT UP AND OPPORTUNITIES ARE CREATED BY ENCOURAGING AND ARRANGING FOR THE TRANSFER OF EMPLOYEES BETWEEN DEPARTMENTS, AND FILLING VACANCIES AND PREFERENTIAL JOBS FROM WITHIN THE ORGANIZATION WHENEVER POSSIBLE.

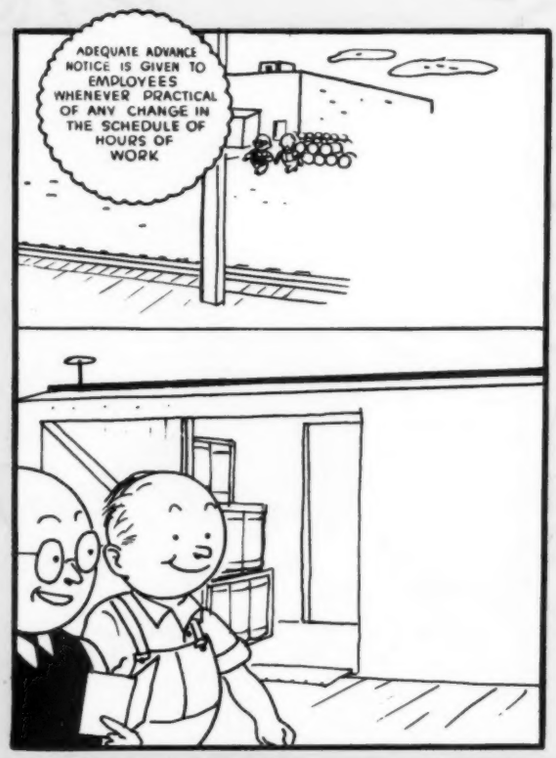
JIM SEZ: "Transfers between departments give you a chance to learn more for promotion. Promotions are from the ranks, too." BUD ADDS: "Then, if I've got ambition and if I've got what it takes, I can go ahead. That'll please the wife and kids and my friends." JIM SEZ: It also gives a man a greater sense of satisfaction to be accomplished and versatile"



JIM SEZ: "The boys on the job are trained for promotion." **BUD ADDS:** "That way you help a fellow to help himself, eh?" **JIM SEZ:** "The better worker you are, the more valuable you are . . . to yourself, your wife, kiddies, and family, and your union"


PROMOTION OR TRANSFER IS ON THE BASIS OF ABILITY AND MERIT, RECOGNIZING SENIORITY OF SERVICE WHEN OTHER FACTORS ARE EQUAL.

JIM SEZ: "In promotions, when everything else is even, the fellow with the most seniority gets the job." **BUD ADDS:** "That way you give the man every break, at the same time remembering that a company has to operate efficiently to stay in business and have a job for me." **JIM SEZ:** "Check. So, a nice machine-like balance is set between job security and incentive to do better, as the professors say"



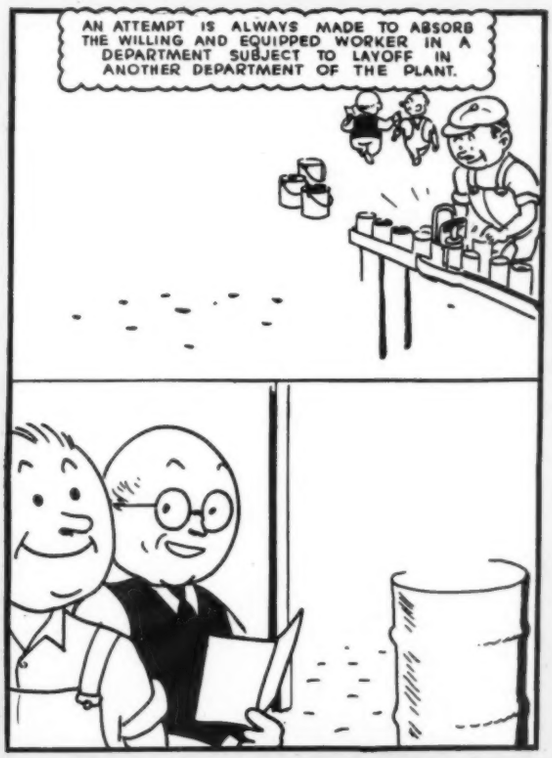
JIM SEZ: "We tell the folks ahead of time when there's going to be a change in schedule." **BUD ADDS:** "That's mighty complicated for the company sometimes, I bet." **JIM SEZ:** "It sure is. But we know how fellows make plans to be with their families and sure hate to disappoint the wife and kids"

JIM SEZ: "Layoffs are by units and departments." **BUD ADDS:** "Why is that?" **JIM SEZ:** "This factory is really a lot of different plants. Each has its own problems, each its own staff. Yet they work together. To keep crews together and to keep operating efficiently, and because each worker and his union feel a man has an interest in his job, layoff is by units and departments"

JIM SEZ: "Production, efficiency, and ability of the worker is kept in mind, too." BUD ADDS: "Sure. Everybody knows you gotta earn your salt wherever you are." JIM SEZ: "Bud, that's true for everything you do in life. You get nothing for nothing. You only get out of life as much as you put into it"

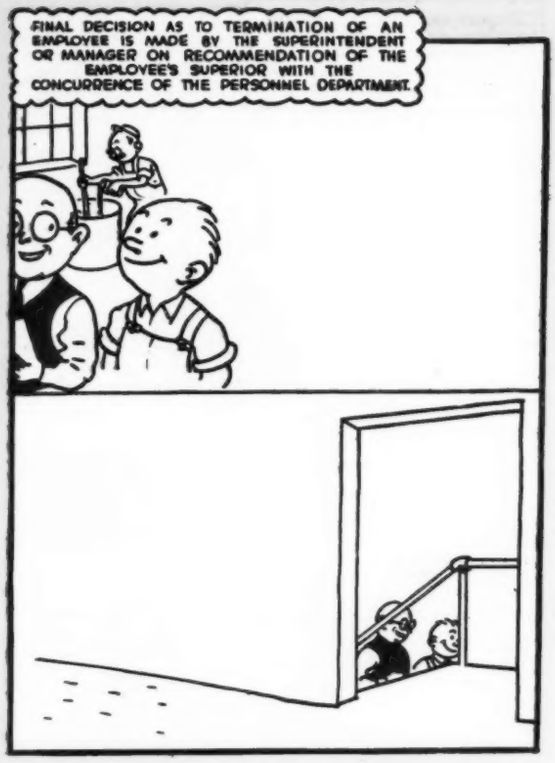
ADEQUATE ADVANCE NOTICE WHENEVER PRACTICAL, AND FULL AND HONEST EXPLANATIONS ARE ALWAYS GIVEN TO ALL REGULAR EMPLOYEES WHENEVER IT IS NECESSARY TO LAY OFF.

JIM SEZ: "Explanations and advance notice is given in layoffs." BUD ADDS: "Gives a fellow as much time to plan as possible. Also to scout around for an in-between job." JIM SEZ: "A layoff is tough on all of us. It's a heartbreaker to you, to me, to Dick Shainwald, our vice-president, and to old man Lowe, the prexy. For years the company has been trying to have all-year production for everyone. They're making headway, too"


AN ATTEMPT IS ALWAYS MADE TO ABSORB THE WILLING AND EQUIPPED WORKER IN A DEPARTMENT SUBJECT TO LAYOFF IN ANOTHER DEPARTMENT OF THE PLANT.

JIM SEZ: "We try to use folks laid off in other departments." BUD ADDS: "A guy gets a break that-a-way he can't get many other places." JIM SEZ: "That's part of the program of trying to give all-year jobs. Also, the company is plenty proud of the character of its workers —and wants to keep them, and keep them busy"

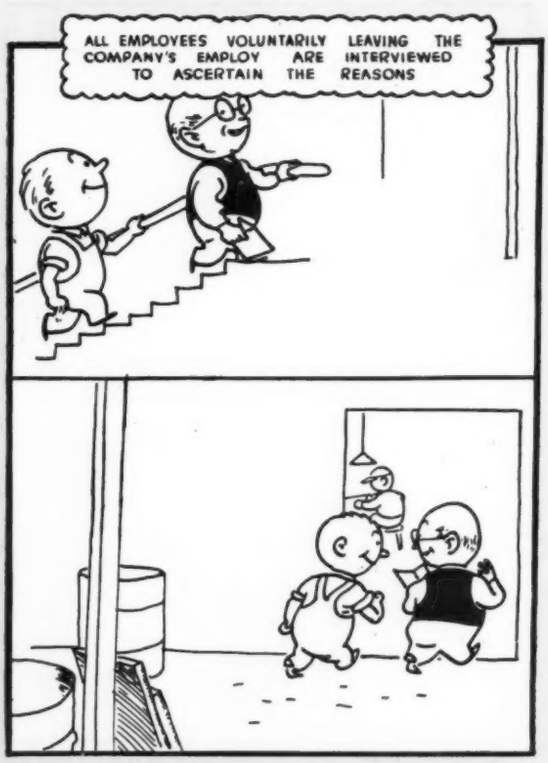
JIM SEZ: "A fellow gets canned only for just cause. He is told the full story, too." BUD ADDS: "Getting canned is always tough to take. From what I've seen in other places, no matter how proper it was to fire the guy, he was generally red-headed even after a talk." JIM SEZ: "Talking over the whole thing protects the worker. If the company is wrong, he explains and saves his job. If he's wrong, the talk helps him get straightened out."


FINAL DECISION AS TO TERMINATION OF AN EMPLOYEE IS MADE BY THE SUPERINTENDENT OR MANAGER ON RECOMMENDATION OF THE EMPLOYEE'S SUPERIOR WITH THE CONCURRENCE OF THE PERSONNEL DEPARTMENT.

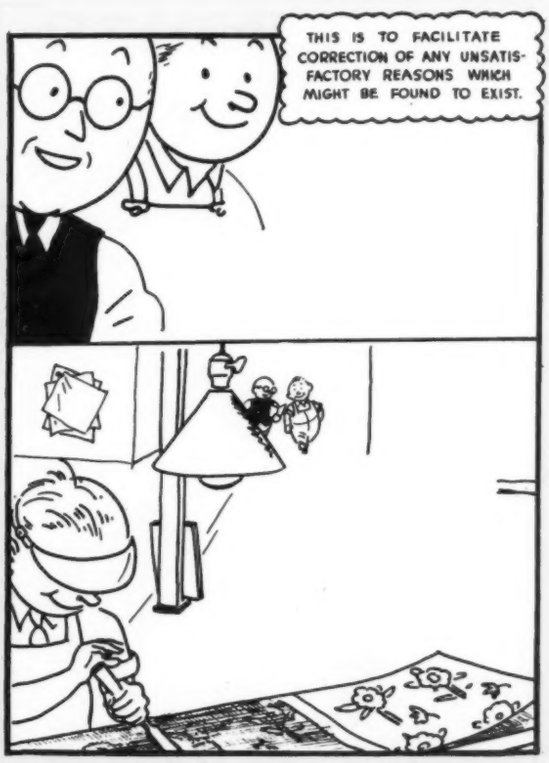
JIM SEZ: "No one executive fires a man. The worker's superior recommends dismissal for the good of the man, his fellow-workers, and the company. But the personnel department has to give the final okay, before it's official." **BUD ADDS:** "Gee! Everybody's in on it but the stove and the kitchen sink." **JIM SEZ:** "It has to be an open-and-shut case, checked by several responsible executives, beginning with the foreman"

ALL CHANGES IN EMPLOYEE STATUS, INCLUDING TRANSFERS, ADVANCEMENT, LAY-OFFS, DUE TO LACK OF WORK AND TERMINATION ARE SUBJECT TO THE CONCURRENCE OF THE PERSONNEL DEPARTMENT.

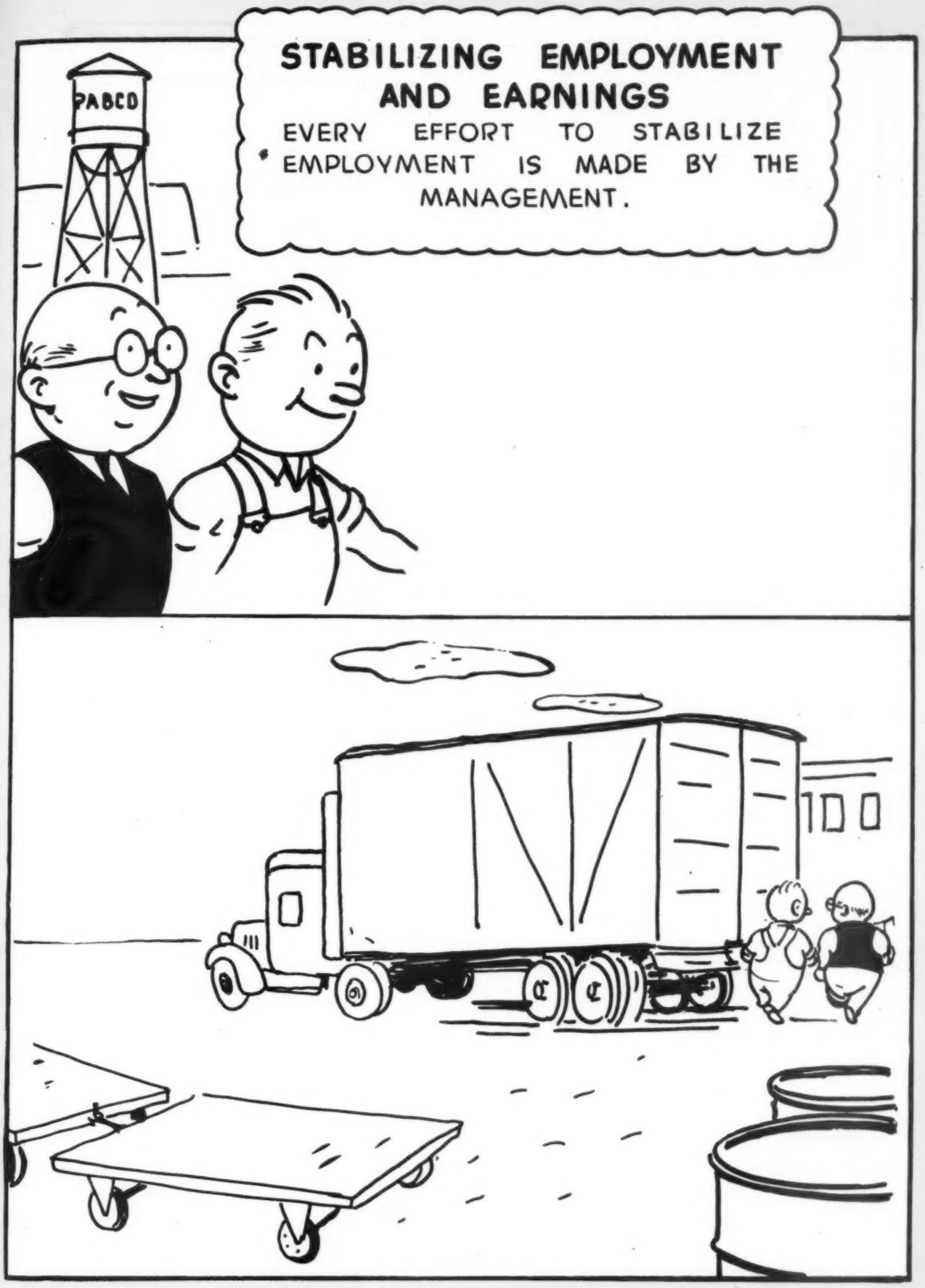
JIM SEZ: "The personnel department has to okay every change in a man's status." **BUD ADDS:** "So you got a personnel department that really takes care of the employee's interest." **JIM SEZ:** "One of the best. They'll check the man's record. The personnel department's okay is important. It makes sure the change is in apple-pie order"



JIM SEZ: "Whenever a fellow quits, we try and find out why." **BUD ADDS:** "A little farewell party between the man and the representatives of the management, huh?" **JIM SEZ:** "More important. If the man has a beef, it gives us a chance to find out what's wrong and correct it. Gives us a chance to find out our strong and weak points"



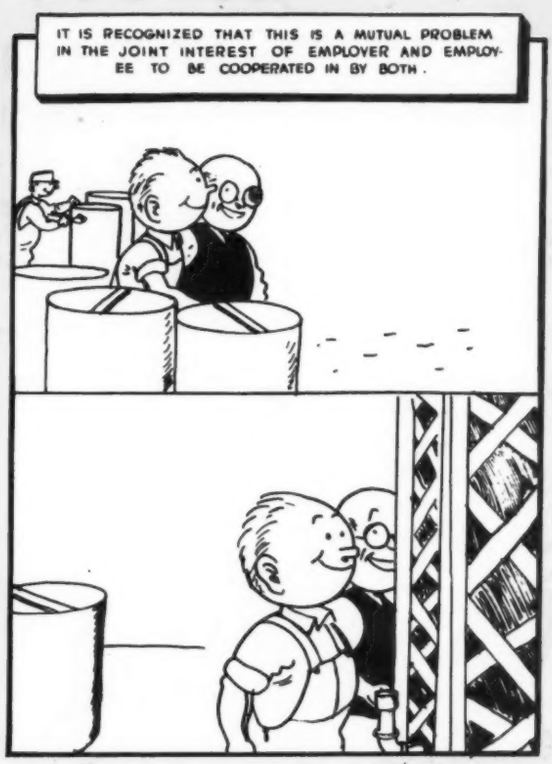
JIM SEZ: "Then we correct any unsatisfactory set-up." **BUD ADDS:** "Do you really do that?" **JIM SEZ:** "You bet, and it sure helps. You see, during the depression a lot of professional men and women took factory jobs to keep eating regularly. Now some of these people are getting jobs in their professions. When they leave, they give us lots of helpful tips we wouldn't otherwise get"



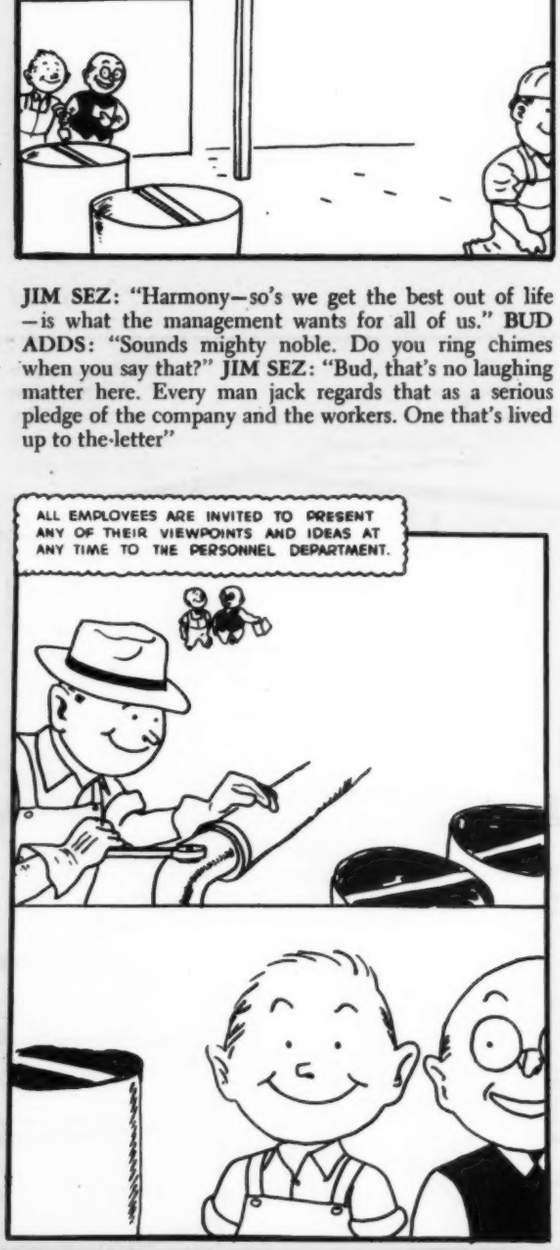
JIM SEZ: "We try every way we know how to stabilize our factory employment." BUD ADDS: "How do you do that?" JIM SEZ: "It would take a book to write everything the firm's done. Promoting sales in off seasons; putting millions of bucks in new warehouses; scheduling production right; doing maintenance work in slow months, and so on"

EMPLOYEE RELATIONSHIPS
EVERY EFFORT IS MADE BY THE MANAGEMENT TO ESTABLISH A MOST HARMONIOUS RELATIONSHIP BETWEEN ALL PARTIES CONCERNED TO PROVIDE TO THE FULLEST EXTENT POSSIBLE, SAFETY, EARNINGS AND SUPERIOR WORKING CONDITIONS FOR EMPLOYEES, ECONOMY OF OPERATION, QUALITY AND QUANTITY OF OUTPUT, CLEANLINESS OF PLANT AND PROTECTION OF PROPERTY.

JIM SEZ: "Harmony—so's we get the best out of life—is what the management wants for all of us." **BUD ADDS:** "Sounds mighty noble. Do you ring chimes when you say that?" **JIM SEZ:** "Bud, that's no laughing matter here. Every man jack regards that as a serious pledge of the company and the workers. One that's lived up to the letter"



JIM SEZ: "Harmony has to be worked out by all of us folks cooperating, Bud." **BUD ADDS:** "Up to the men and women, too, to help make it work, eh?" **JIM SEZ:** "We've got the finest body of self-reliant people you'll find anywhere. So the management takes the slant that they're perfectly able to cooperate in all policies and problems. And they do"



JIM SEZ: "The personnel department is glad to get your viewpoints any time." **BUD ADDS:** "Do you got to ask permission in writing and make an appointment, like you do in most places?" **JIM SEZ:** "Fiddlesticks! Anytime you're not working, or your department head can spare you, you can go right in. The welcome sign is always out"

THE MACHINERY EXISTS FOR THE CONSIDERATION OF ALL COMPLAINTS AND GRIEVANCES, INCLUDING APPEAL TO THE HIGHEST EXECUTIVES AND ADJUSTMENT BOARDS.

JIM SEZ: "Gripes and grievances can be appealed right to the brass hats and adjustment boards." **BUD ADDS:** "Everything fixed up to run smoothly." **JIM SEZ:** "You bet. We want complaints and grievances settled as fast and as justly as they can be. That makes for contentment and peace of mind"

One-Fifth the Paperwork But Closer Control

LOUIS A. HRADESKY, Methods Engineer, Curtiss-Wright Corporation, Propeller Division, Caldwell, N. J.

How METHODS ENGINEERING TECHNIQUES may be applied to the work of the methods engineers themselves is illustrated by a system of production and manufacturing methods control that has been set up by the steel blade methods group in the central engineering department of the Curtiss-Wright Propeller Division at Caldwell, N. J. Result, volume of paperwork has been cut close to 80 percent.

For example, it was necessary under the old system to maintain a separate set of operation sequence sheets for each design in production. Master sequence sheets (Figure 1) can list up to ten separate designs and have thus eliminated this duplication.

Similarly, it used to be necessary to maintain an average of two process sheets for each operation of each individual design in production. The "shadow and tool sheet" (Figure 2), which contains drawings, procedures, and tooling data, can list up to ten separate designs.

No Needed Detail Omitted

These shadow and tool sheets are the means by which established operation sequences and standard operation procedures are presented to everyone concerned. They contain all necessary information in sufficient detail for manufacturing; they are clear and simple to read. With them the operator does not have to refer to complicated blueprints to do the work. The sheets are easily reproduced from masters in the required numbers by a duplicating process.

Where three shifts are employed, this method definitely establishes a standard procedure of manufacturing. The shadow and tool sheets are valuable in training new personnel, because they are sufficiently detailed for a beginner to perform an operation with a minimum of instruction. Shadow and tool sheets are an assurance that the right thing will be done at the right time with the proper tools and equipment.

In addition to providing instructions for making a product, the shadow and tool sheets are a record of operations, and a source of information used by many departments besides production —such as planning, personnel, store-

OPERATION SEQUENCE SHEET

DATE ISSUED 3-27-45
SUPERSEDES ISSUE DATE 12-19-44 PLANT BEAVER PART NAME CAMBER SHEET NO. 1 OF 7

OPER. NO.	DEP NO	OPERATION	512			528			814			836			1016			830
			1&2C1.5			1C2			3-4&6C3			2&17C2			3&4C4			2C4
		**	C	T	STD.	C	T	STD.	C	T	STD.	C	T	STD.	C	T	STD.	STD.
837		UNLOAD PLATES AND STORE	X			X			X	X		X	X		X	X		X
843		WEIGH PLATES	X			X			X	X		X	X		X	X		X
850		GRIND FOR HARDNESS TEST	X			X			X	-		X	X		X	X		X
853		HARDNESS TEST	X			X			X	X		X	X		X	X		X
863		INSPECT ROUGH PLATE	X			X			X	X		X	X		X	X		X
867		MARK PLATE IDENTIFICATION	X			X			X	X		X	X		X	X		X
870		PUNCH TEST SLUG	-			-			-	X		-	X		-	X		-
880		MILL PLATE EDGES	X			X			X	-		X	-		-	-		-

**C—Conventional T—Taper Rolled

Figure 1. Master operation sequence sheet shows routing of propeller parts. Up to ten designs may be listed; six are listed here. Operation titles are short. All information subordinate to each title is found on the corresponding "shadow and tool sheet" (see Figure 2). Designs do not need exactly similar sequences to permit scheduling. The X and dash system, indicating whether or not operation is to be performed, gives an over-all picture of the material flow and aids in standardization

Figure 2. Shadow and tool sheet (this one is for operation 880 on the operation sequence sheet, shown in Figure 1) is sufficiently detailed so that a beginner can perform the operation with a minimum of instruction

EQUIPMENT AND TOOL NAME	PART NO. TOOL NO.	REQ'D.
CINCINNATI MILLING MACHINE	STD	1
YALE SKID	STD	2
CLAMPS - ANGLE (SET) - 3	BT-2045	1
CUTTER - SPIRAL SPLIT 2½ x 6 x 14¾ (USE SCRAP CUTTERS IF AVAILABLE)	BT-2248	1
BLOCK - RISER	BT-2059	2
ARBOR - 2½" x 42"	BT-2220	1
PLATE - STOP	BT-2221	1
CROW BAR - SPEC.	BT-2222	1
COOLANT - VAN STRAATON #523	STD	-
GAGE - PLATE WIDTH (512)	SPG-20532	1
" (528)	SPG-31000	1
" (814)	SPG-20531	1
" (836)	SPG-20531	1
PUNCH - FORKED	BT-2292	1
WRENCH - DOUBLE END (1⅛ x 1)	STD	1
HAMMER - 8 LB. SLEDGE - DBL. FACE	STD	1
BAR - SPEC. PRY	BT-2225	1
WRENCH - D'BL. END (1¼ x 1)	STD	1
WRENCH - 1¼ SOCKET, RIGHT ANGLE HANDLE	STD	1
BRUSH - CHIP	STD	1
PAN - CHIP	BT-2250	1
BLOCK - WOOD (STEEL REINFORCED TO PROTECT MACHINE)	BT-2224	1
CLOTH - WIPING	STD	-
BUDGIT HOIST	STD	1
SPACERS - 2½" DIA. (SET)	BT-4659	1

					836-17C2	
					836-2C2	
					814-4&6C3	
					528-1C2	
					512-1&2C1.5	
CHG. LET.	ALTERATION MADE	DATE	CHG. BY	CHK. BY	USED ON MODEL NO.	ENG. CHG.

DESIGN	NO. OF PLATES	"A"	TOL.	"B"	TOL.
836	10	14.375"	+.000 -.070	14.250"	+.000 -.070
814	10				
528	10	12.407"		12.343"	
512	11	10.905"		10.812"	

room, dispatching, metallurgy, safety, experimental, timekeeping, job rating, labor measurement, design engineering, plant engineering, and production engineering. All these departments depend on the shadow and tool sheets to furnish an accurate over-all record of operations which can be depended upon and, therefore, they must be complete in every detail.

When a newly designed steel propeller blade is to be manufactured in one of the division plants, or an alteration is required on a design in production, the central methods section receives a "production authority" from the chief production engineer. This "authority" specifies the blade model number, sales order number, quantity requirements per month, plant where the blade is to be fabricated, "ready to manufacture" (RTM) date, etc.

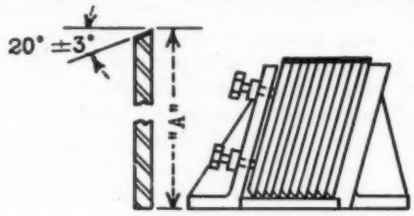
The methods engineer assigns the "authority" to the methods man responsible for new blade design methods to process the blade for production, with proper instructions and all necessary data to facilitate his work, such as part numbers of similar pieces, shadow and tool sheets of other designs of similar nature, or a standard procedure which may be applied to the blade design in question.

Carefully Analyzed

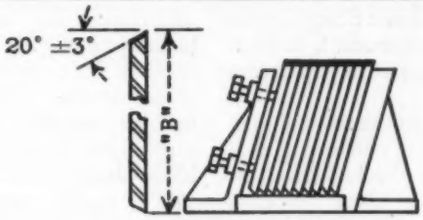
The new design blade is subjected to a close analysis for the purpose of developing a sequence of operations (Figure 1) to be used in fabricating the blade. Available equipment at the fabricating plant, part cost, machine load charts, new manufacturing short cuts, are taken into consideration in writing a sequence of operations.

When the sequence of operations has been established and tentative (rough draft) shadow and tool sheets (Figure 2) have been written and approved by the methods engineer, they are assigned to the drafting and typing section for completion on master vellums. Upon their completion, they are typographically and dimensionally checked against the tentative original sheets and initialed by the methods man who prepared the original sheets, and then returned to the methods engineer for his study, approval, and initials. Prints of the master vellums are then shipped to the local plant production engineer, for release to production.

When a blade has been put on its first run in production, all operations are carefully watched for any changes which may be necessary or desirable. In order to maintain accurate records on the status of each operation from the time of its inception, the local production engineer notifies central methods engineering of necessary revisions by a change request. A special note is then made in order to avoid a re-occurrence of this condition on any future designs. Minor changes are made from time to time according to definite production needs or new



FIRST MILLING CUT



SECOND MILLING CUT

OPERATION PROCEDURE

1. CUTTER IS MOUNTED ON ARBOR TO MILL CONVENTIONAL. THE CUT BEGINS AT STENCILED END & PROGRESSES TOWARD THE TIP END OF PLATES.
2. WIPE FIXTURE & CHECK TO SEE THAT IT IS FREE OF CHIPS & DIRT.
3. POSITION END PLATE ON FIXTURE & SECURE.
4. REMOVE PLATES FROM SKID & LOAD ON BED PLATE ONE AT A TIME UNTIL ALL PLATES ARE LOADED, SET PLATES AT PROPER ANGLE. (SEE CHART)
5. TIGHTEN SET SCREWS IN PLATE HOLDING FIXTURE.
6. HAMMER TOP EDGES FOR PROPER SEATING OF PLATES.
7. RE-TIGHTEN SET SCREWS SECURELY & ADJUST SHIELD.
8. START CUTTER & TURN ON COOLANT. BE SURE THAT A STEADY FLOW IS DIRECTED ON THE CUTTER WHILE MILLING.
9. RUN TABLE AT FAST SPEED UNTIL STENCILLED END OF PLATES ARE WITHIN 3" OF CUTTER, THEN SET MACHINE TO SPECIFIED AUTOMATIC FEED.
10. MILL PLATES (SEE CHART FOR FEEDS & SPEEDS).
11. UPON COMPLETION OF CUT, REVERSE FEED & RUN TABLE AT FAST SPEED TO ORIGINAL LOADING POSITION.
12. TURN OFF COOLANT & STOP CUTTER.
13. CLEAN OUT CHIPS.
14. REMOVE SHIELD & LOOSEN BOLTS ON HOLDING FIXTURE.
15. REMOVE END FIXTURE.
16. LOOSEN PLATES WITH BAR & REMOVE TO SKID.
17. CLEAN BED PLATE & FIXTURE.
18. POSITION END PLATE ON FIXTURE & SECURE.
19. REMOVE PLATES FROM SKID & LOAD IN BED PLATE ONE AT A TIME MILLED EDGE DOWN. SET PLATES AT PROPER ANGLE.
20. FOLLOW PROCEDURES 5, 6, 7, 8, 9,& 10.
21. AFTER FOUR INCHES OF THE PLATES HAVE BEEN MILLED, OPERATOR IS TO BACK PLATES AWAY FROM CUTTER AND HAVE INSPECTOR CHECK WIDTH OF PLATES WITH GAGE. MAKE NECESSARY ADJUSTMENTS.
22. FOLLOW PROCEDURES 8, 10, 11, 12,& 13.
23. UPON COMPLETION OF ENTIRE CUT, HAVE INSPECTOR CHECK WIDTH OF PLATES AT CENTER AND BOTH ENDS.
24. FOLLOW PROCEDURES 14 & 15.
25. LOOSEN PLATES WITH BAR & REMOVE TO SKID.

CUTTER SPEED R.P.M.	40
FEED IN PER. MIN.	4

NOTE: DIMENSIONS=.010 UNLESS OTHERWISE SPECIFIED.

SHADOW AND TOOL SHEET

OPERATION:	MILL PLATE EDGES				Part Name	CAMBER
Met'ds. Eng.	L.A.H.	11-29-44	Prod. Eng.	Date	Dept. No.	
Proc. Chk.	A.A.W.	11-17-44	Met'lrgy Chk.	Date	Mat'l. Spec.	S.A.E. 4330
Proc. By	H.S.C.	10-28-44	Insp. Chk.	Date	Sheet No.	1 of 1
Drawn By	S.T.	10-28-44	Prod. Chk.	Date		
CURTISS-WRIGHT CORP. PROPELLER DIVISION				Plant BEAVER	Oper. No.	880

methods in an attempt to reduce costs and scrap percentages.

If a change is requested in an operation or sequence of operations by the production engineer without a full knowledge as to how it will affect the part or production, a "temporary deviation" is issued covering a certain quantity of blades for a trial run under close observation. The final results are noted, and, if the method used in the trial run results in the betterment of the product, final approved sheets containing the change are released. In this manner, the product is continuously improved without confusion or disruption to production.

In processing operation procedures and tooling, all information pertinent to cut-down diameter blades, or similar designs with different characteristics, is scheduled on one shadow and tool sheet. This shadow and tool sheet may have additional continued sheets if more space is required.

The shadow and tool sheets have separate schedules for any differences

between the various blade designs, such as plate lengths, thicknesses, hole locations, slight variations in operation procedures, etc.

If the differences between blade designs require so much scheduling that the shadow and tool sheets tend to be confusing, a separate sheet for each blade design is used. Should the operation procedures be identical, then only one of these sheets contains the operation procedure.

If the drawing differences of various blade designs can be scheduled but the operation procedures vary considerably, separate operation procedures are listed for each blade design on the scheduled drawing shadow and tool sheet. If any additional space is needed a continued shadow and tool sheet can be used.

If two different types of material are used for the same blade design, any operational differences between them are combined whenever possible on one sheet, with schedules, provided these differences are not so great as to confuse the operator.

Under the equipment and tool name column the methods man lists (1) all machines and equipment used for all blade design even though some of the equipment may be used only for one blade design; (2) all tools, gages, and material for complete operation for all blade designs. And under the tool number column, if the same tools, gages, and materials are used for all blade designs, he lists the blade tool (BT), special gage (SPG) numbers, or standard tools (STD), and quantity used. If some tools, gages, and materials are used only for one design or size of blade, he lists the blade designation right after the tool, gage, or material name.

Exact Status Shown

Changes in operation sequence, manufacturing procedure, and tooling are made on the original vellums as new and better methods are revealed, which eliminates inadequate verbal or written instructions to an individual, and helps to maintain accurate records of the status of each operation from the time of its inception.

A change request originating at any of the Propeller Division plants is written in triplicate on a form (not shown) which is standard for all blade manufacturing plants. This form shows (1) blade design, size, operation name and number, etc.; (2) date; (3) full description of requested change; (4) reason for requested change; (5) name of person requesting change; (6) approval by (local plant) production engineer; (7) approval by (central production engineering) liaison engineer.

Where Copies Go

The original copy of the form is sent to the central manufacturing methods engineer; the second copy is retained by the local plant production engineer; while the third copy is retained by the person originating the request.

While the change request is being routed to central methods engineering, a process supplement is issued by the local production engineer and stapled to the superseded sheet which remains in effect until master sheets have been changed and issued.

When central methods engineering receives revised master design drawings or notice of a change in blade design, such changes are carefully analyzed to judge their effect on the shadow and tool sheets. If it is determined that the sheets require revision, changes are immediately made on the master vellums and prints go to production.

Change requests from the plants of the Propeller Division are allocated to the methods man in charge of blade designs in production, and the following procedure takes place:

1. When a change is to be made, the prints covering the operation in question are removed from the process book and recorded on the tally found in front of the book.

2. The current sheets are studied and compared with the change request. Points in old sheets not covered in the new request are noted and checked when the operation is investigated.

3. The request is investigated from all angles, and with all persons who are familiar with the operation, including the originator of the request, if possible. A check is made to see that the requested change is warranted and desirable and is accurate and complete, and the operation is processed thoroughly, even though the request itself may be limited in scope.

4. Changes are marked in red on old prints. If they are extensive enough to require making an entire new vellum, the old print is marked "revised" in red pencil. If a new vellum is rendered, a rough sketch of the proposed drawing and the written procedure are first approved by the methods man in charge of designs in production.

DESIGN BEAVER MASTER

OPERATION SEQUENCE OF

HOLLOW STEEL PROPELLER BLADES

S.A.E. 4330

Issued to: _____

Please destroy all superseded sheets and place the attached in your book

Cost Distribution Code

Letter

P — Production
I — Inspection
M — Material Control
R — Repair
PT — Part
X — Oper. performed
— Oper. not performed

Operation Number Code

Number Ending in

0 & 5 — Production
3 — Inspection
7 — Material Control

Thrust - 0 to 740
Camber - 750 to 1990
Blade - - 2000 to 6000

L. A. Hradesky
Methods
Engineer

CHANGE RECORD

Change Number	Sheets Affected	Date Changed
10	1, 2, & 3 of 6 Thrust	
	1 & 2 of 7 Camber	
	1 of 14 Blade	3-27-45

Figure 3. Key sheet provides a record of cost and numbering codes, and is used for authorizing a change in sequence

5. After the proposed changes have been approved, the old vellum is obtained from the file and records section and is changed accordingly. If a new vellum is necessary, no change is made on the old vellum; instead it is marked "obsolete," with the methods man's initials and date. The methods man in charge of designs in production instructs the draftsman to make necessary drawings or vellum corrections, and has the corrected procedure typed. The work is checked after it comes from the draftsman and typist.

6. The change request is marked "completed" and the date and methods man's initials are placed in any open space on front of request. If additional sheets are affected, other than the ones for which the request was originated, a list of these sheets is made on the reverse side of the original change request form.

7. Sheets are arranged in order, either by operation number or blade design, and checked to see that the old prints, old vellums, new vellums, and change request forms are together and that "Change Blocks" have been properly filled out and change letters are on the sheets referring to the proper items. The completed work is then given to the methods man in charge of designs in production, for checking. He checks the vellums, initials them, and detaches the obsolete vellums (if any) and the old prints for reference filing. He then makes out a request for prints (not shown) in duplicate, showing the date, blade design, operation number, etc. The vellums are then printed.

8. The tool change notification form (not shown) is filled out if a change in tooling is necessary, and forwarded to tool design section.

9. The key sheet (Figure 3) and tally sheet (Figure 4) notification forms are filled out, giving all information, which includes revised operation sequence, revised procedures or tooling, and whether any new sheets have been added or old sheets deleted.

10. The methods man in charge of blade designs in production marks the change request and the notification forms "completed," dates and initials them, and returns them to the methods engineer for his file.

11. All corrected and necessary information is then distributed to persons authorized to receive it.

12. The methods section prints are placed in the proper process book, and the vellums and all other original data are then returned to the file and record section for future use.

CENTRAL PRODUCTION MF'G. METHODS ENGINEERING
Caldwell, N. J.

Plant Beaver — Date 3-27-45

Design Beaver Master (Thrust & Camber)

SUBJECT: Operation Sequence Change

Chg. No.	Oper. No.	Operation Name	Reason
	83	Inspect Edge Milling (Thrust)	Eliminated
	133	Inspect Shank Hole (Thrust)	"
	503	Inspect Blank (Thrust)	Was Oper. 493
	533	Inspect Polished Blank (Thrust)	Eliminated
	603	Inspect Reamed Hole (Thrust)	"
	1330	Grind Before Forming (Camber)	Was "Grind Edges"

Figure 4. Tally sheet shows changes made, eliminating necessity for persons on mailing list to compare old against new sheet

Since instituting the above program, savings have been transmitted through all departments of the plants of the division that are related to central production engineering. Some of the more apparent results are:

1. Eight process books were reduced to one master process book.

2. Duplication of effort has been eliminated.

3. Technical data necessary to production are presented in a clear concise manner so that they can be understood by the ordinary worker.

4. Standardization is encouraged by listing the sequence of operations of various designs on one sheet.

5. Standardization of operation numbers, titles, procedures and tooling among various blade designs was completed.

6. Operation sequence sheets, shadow and tool sheets, change request forms, key sheets, and tally sheets were standardized for all plants.

7. Service departments, such as labor measurement, job rating, are able to correlate their work to better advantage because of standardization.

8. The methods department personnel was reduced 50 percent.

9. Paperwork has been reduced 80 percent.

10. Correspondence has been reduced 60 percent.

11. Shadow and tool sheet bulletin board space on shop floor was reduced 80 percent.

12. Interdepartmental relations have been greatly improved through the elimination of unnecessary paperwork.

EVERY MONTH, AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to WHAT'S NEW in EQUIPMENT (page 172) . . . a summary of LABOR DEVELOPMENTS (page 230) . . . things YOU WANT TO KNOW more about (page 220)

Proper Placement Eases Veterans' Return to Work

DON S. MILLER, Personnel Director, Gerity-Adrian Manufacturing Corporation, Adrian, Mich.

TWO COMMITTEES have been set up at Gerity-Adrian Manufacturing Company to help returning servicemen find themselves in the post-war world. In this company's opinion many veterans want new jobs, different work from that which they did before they went into service. Some want to make use of skills acquired in service—radio, electricity, and mechanics. They want security after months or years of minute-to-minute uncertainty. And the employer who can offer them those job opportunities and that security can bank on their loyalty.

One of these committees, the larger, is comprised of two representatives of management, two of the union, and two of the servicemen's group. It is part of this committee's job to find out what the returning veteran is best fitted to do, and to reconcile any differences that may arise between the union and management.

The other committee is the welcoming committee, made up of former servicemen. It is its responsibility to see that the veteran coming back to work gets the proper kind of informal welcome.

This "servicemen's welcoming committee" was born when the company president took a trip through the plant and saw one of the 300 men who had entered military service working at a bench in the plating department.

"When did you get back?" he asked.

"Just about a week ago," said the employee.

The president thought that was a "hell of a way to say 'Welcome Home,'" and he decided to do something about it. The result was the committee of ex-servicemen working in the plant. Members of the committee see that veterans get off to the right start, that they know what the company is doing, and the kind of people they will be working with.

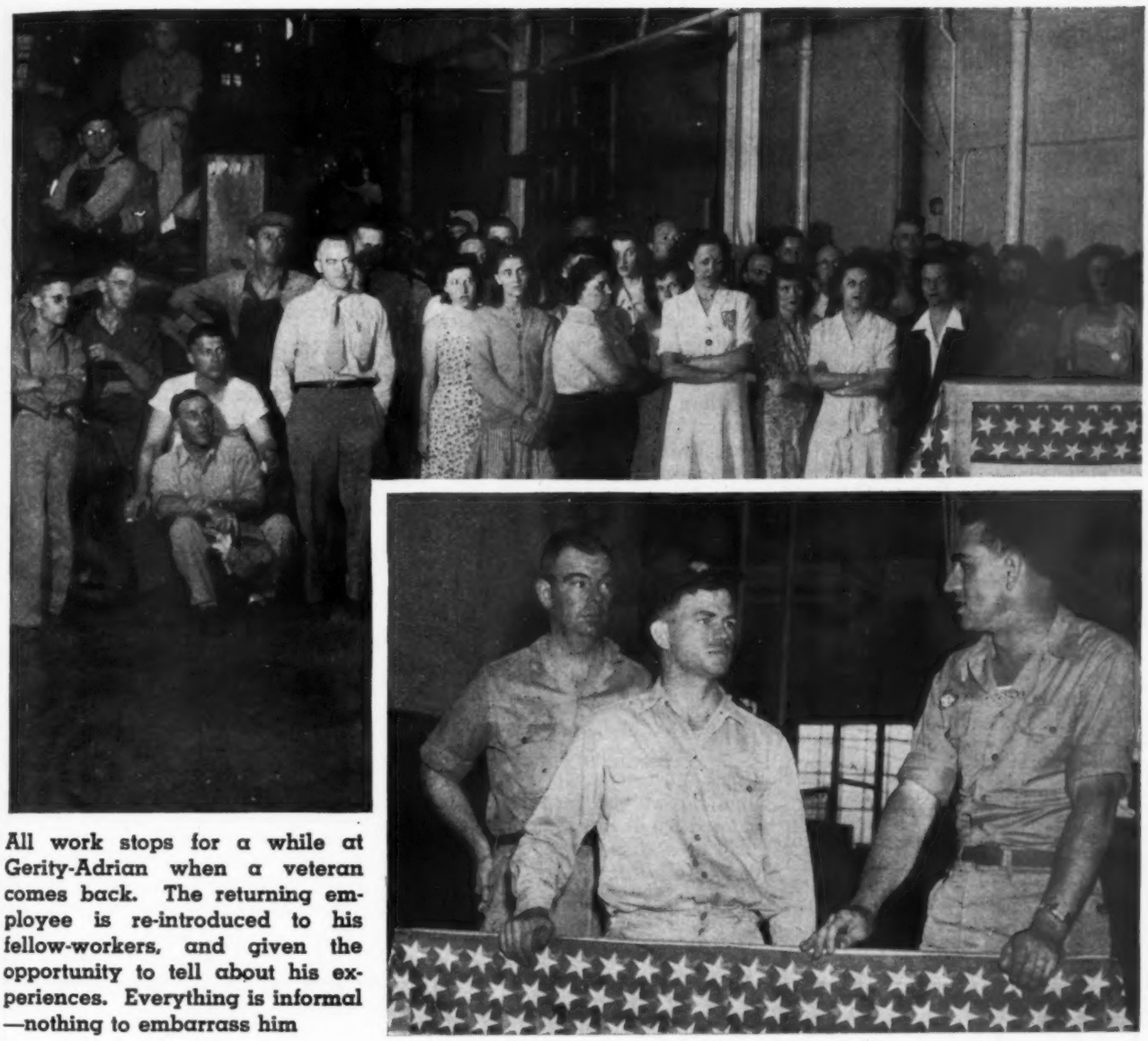
When a discharged serviceman comes back to work, everything stops for a while. He is introduced to other workers in a short, informal ceremony. There is nothing elaborate to embarass him or make him self-conscious—just enough of a get-together so that when he comes in to work other employees will say "Hi, John," or "Hi, Bill," instead of wondering "who's the new guy."

Part of the business of getting acquainted is knowing where a man has been, what he has done, and what he has seen. A member of the servicemen's committee asks the veteran what outfit he was with, how long he was in service, where he has been. If he saw action, is there anything he wants to tell about it?

Some men want to talk about their experiences, some do not. At the Gerity-Adrian introductory ceremony, if a man does not want to talk, the committeeman explains that he is interested in today and tomorrow and next week—not in what is past. No compulsion or pressure is put on—nothing that would destroy the informality of the affair. If the veteran likes to tell about his experiences, he can talk, and other employees can ask questions.

At this ceremony, too, each veteran

Two representatives of management, two of the union, and two members of the servicemen's welcoming committee get together to formulate policies that will smooth the road of former employees returning from service with the armed forces, and make sure they are placed in jobs that suit them



All work stops for a while at Gerity-Adrian when a veteran comes back. The returning employee is re-introduced to his fellow-workers, and given the opportunity to tell about his experiences. Everything is informal —nothing to embarrass him

is given a leather folder to carry discharge papers and related material.

When work is resumed, the veteran is taken around the plant to see what is being done. Everybody does a better job, the company feels, when he knows what he is making, and what part he will contribute.

Preventing misunderstandings before they occur is a responsibility of these committees. Before the program started, one man was charged with a union initiation fee which he was not supposed to pay. The money was refunded later. It was all a mistake, but it left a bad taste.

Another man started out in a lower wage bracket than he should have been in. These are the things the committee strives to prevent.

The program has union approval. The union's policy is that anything that will help solve the problem of getting returned servicemen off to a right start is all to the good—these men are not only veterans, they are union members, too.

Their Own Language

Servicemen who have come back to work under the program likewise express approval. One of them, returned after almost five years in service, expressed it thus:

"It's good to talk to men who speak your own language, for a while at least. When I first got back, I jumped when a piece of metal was dropped on the floor. I saw plenty of men who will be far worse off. They'll have to start on a job they can get used to gradually or it won't work."

A member of the servicemen's committee reported one man who couldn't return to his old job of plating because he had spent too much time in tropical jungles. A man who has been exposed to the sun too long on New Guinea cannot stand the fumes and acids of plating vats. He had to have another job, and the company paid him his old rate while he was learning.

Other men may not be able to handle work calling for good eyesight for some time, because, particularly in the infantry, their eyes are all "bleared up" from the tropical sun.

Many of the men returning to Gerity-Adrian go first to the Lenawee County Veterans Service Center to look for work. The counselor in charge of the center reports excellent results from the Gerity program.

Job security is not new policy for Gerity-Adrian. When the company was formed in 1937, two related products were selected for manufacture to insure as steady employment as possible. Records show that in the five years before the war 80 percent of the workers were steadily employed.

Selling the New Layout

GEORGE DeVRIES, Standards Supervisor, Raytheon Manufacturing Co., Waltham, Mass.

WHEN A NEW LAYOUT involving two conveyorized lines was proposed for the assembly department in the electrical equipment division of Raytheon Manufacturing Company, and accepted by the management, the problem of how best to introduce it to the factory personnel came up for serious consideration.

Part of the reason for this consideration was the fact that a large majority of the employees, both supervisors and operators, had been with the company for many years, and had been using practically the same methods of production all during their service. Hence the methods department gave much thought to means of adequately informing the working force of details of the proposed layout, so that the proverbial "resistance to change," typical under the circumstances, would be reduced to the minimum.

One of the methods adopted was the use of a series of posters, prepared by Raytheon's display shop. These posters appeared weekly on the fluorescent-lighted departmental bulletin boards.

The first poster was entitled "Introducing the Conveyor System." A cutaway picture of the building showed the proposed new layout. The advantages were listed in five blocks of type:

Safer—more aisles, improved work areas, clearer floors, and less lifting or hauling of units and heavy materials will diminish injury and fire hazards.

More pleasant—new color scheme, better locker accommodations, individual workbenches, improved production papers, better instruction, all jigs, special tools, and materials furnished at benches, will combine to make this a better place to work.

Better earnings—smooth continuous production flow, elimination of waste time and motion, test department at each conveyor, and use of bonus system with fair time standards will enable operators to earn more money.

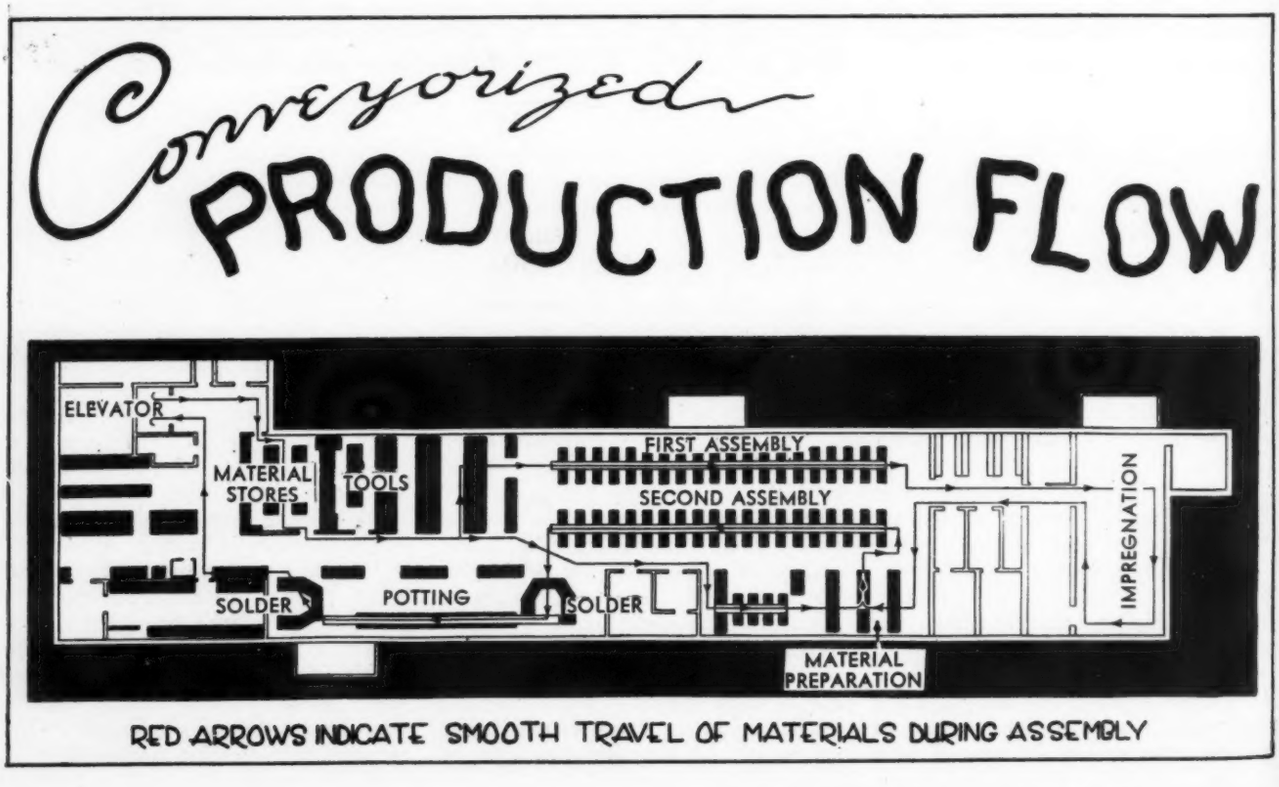
Healthier—new floor layout will permit better cleaning, greatly reduced truck movement will create less dust, and air will be fresher through improved handling of fumes, less fatigue will be evident, due to elimination of unnecessary steps.

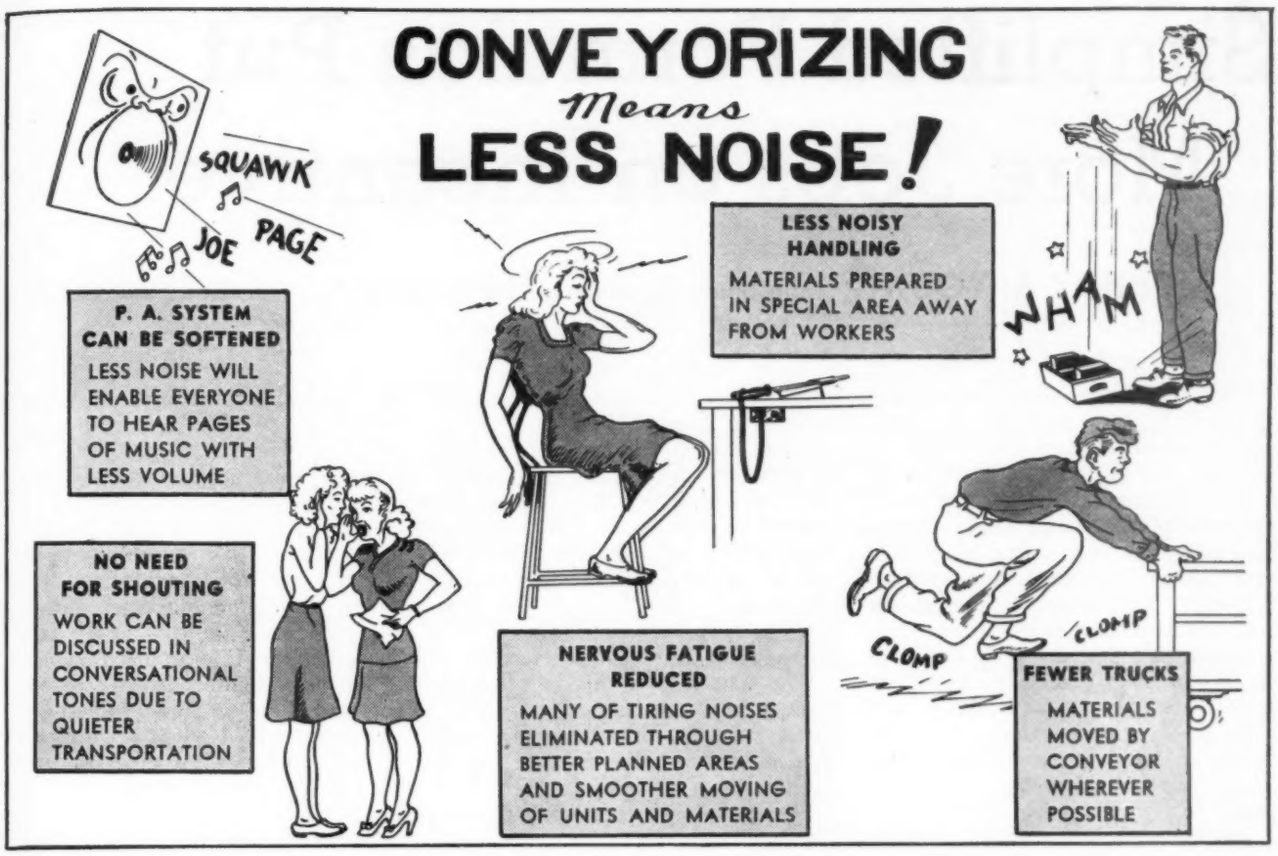
Quieter—smooth running conveyors will move much of the material now being noisily hauled by truck, and modern production flow will eliminate all former extra travel, resulting in a more restful atmosphere.

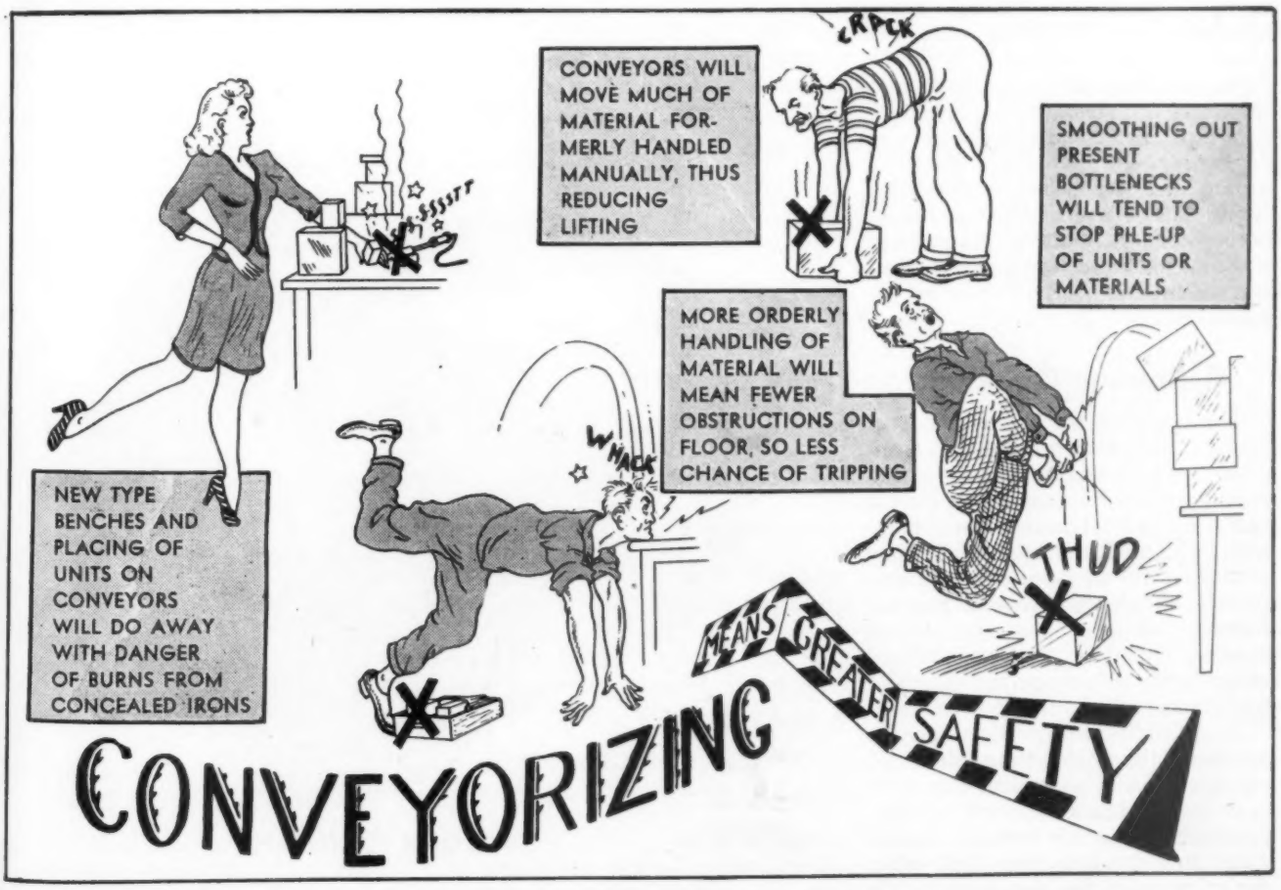
Later posters, some of which are shown below and on the facing page, illustrated these advantages in greater detail.

The value of this technique was evident from the day the first poster appeared. Interest in the new project developed immediately. Employees besieged their supervisors with questions. Having been given, in supervisory conferences, the details regarding the proposed installation, the supervisors were prepared to answer intelligently.

By the time the physical changeover was made, the factory personnel had become thoroughly familiar with the idea, and were actually looking forward to it. Raytheon management feels that the beneficial results of informing those most affected by this type of departmental change of the reasons for, and the benefits of, such a move, make the dissemination of such information an industrial relations "must."




CONVEYORIZING
Means
LESS NOISE!
SQUAWK
JOE
PAGE
P. A. SYSTEM CAN BE SOFTENED
LESS NOISE WILL ENABLE EVERYONE TO HEAR PAGES OF MUSIC WITH LESS VOLUME
LESS NOISY HANDLING
MATERIALS PREPARED IN SPECIAL AREA AWAY FROM WORKERS
WHAM
NO NEED FOR SHOUTING
WORK CAN BE DISCUSSED IN CONVERSATIONAL TONES DUE TO QUIETER TRANSPORTATION
NERVOUS FATIGUE REDUCED
MANY OF TIRING NOISES ELIMINATED THROUGH BETTER PLANNED AREAS AND SMOOTHER MOVING OF UNITS AND MATERIALS
CLOMP
CLOMP
FEWER TRUCKS
MATERIALS MOVED BY CONVEYOR WHEREVER POSSIBLE


CONVEYORS WILL MOVE MUCH OF MATERIAL FORMERLY HANDLED MANUALLY, THUS REDUCING LIFTING
CRACK
SMOOTHING OUT PRESENT BOTTLENECKS WILL TEND TO STOP PILE-UP OF UNITS OR MATERIALS
SSSSTT
MORE ORDERLY HANDLING OF MATERIAL WILL MEAN FEWER OBSTRUCTIONS ON FLOOR, SO LESS CHANCE OF TRIPPING
NEW TYPE BENCHES AND PLACING OF UNITS ON CONVEYORS WILL DO AWAY WITH DANGER OF BURNS FROM CONCEALED IRONS
WHACK
THUD
CONVEYORIZING
MEANS GREATER SAFETY

Before the installation of new conveyorized assembly lines was even begun, Raytheon employees were "sold" on the idea by posters which explained the advantages to them of the proposed layout

Simplified Formulas Put More Jobs on Incentive

MURRAY A. YOUNG, Time Study Supervisor, The Black-Clawson Co., Hamilton, Ohio

How to maintain incentive coverage over a wide range of similar yet essentially non-repetitive work—with a limited staff of time study personnel—is a problem faced by many manufacturers of heavy and widely diversified products. Time-saving methods of establishing time allowances—general formulas, job formulas, adaptations, and standard time data—are not only indispensable but are also simplified to the greatest practicable extent at The Black-Clawson Company to provide quick standard times for thousands of different jobs whose various operations may range from a few seconds' to several days' duration.

A typical example of job formula simplification may be found in the method used for establishing a time allowance for machining the job (known as a pipe roll head) shown in Figure 1. Material is cast iron; machining is completed in one operation on a turret lathe, and consists of turning two sizes on the outside diameter, turning hub (when hub is specified), facing outside end of head and hub, boring for steel journal, chamfering small end of head which enters pipe, and chamfering end of bore which journal enters.

A Specific Operation

The operation may be one of from twelve to twenty on a completely fabricated roll. In this instance the machining of head appears as Operation No. 6 on the "Standard Time" office record (Figure 2). In establishing time allowances for all incentive operations on rolls of this type, three or four job formulas and eight or nine sets of standard time data are commonly used to cover the wide range and variety of operations.

As an additional aid in quickly determining the needed time values, the obverse side of the standard time form is utilized to bear condensed job characteristics forms for formula applications and standard time data tables for as many of the operations as the space will permit.

The standard time form shown is an example of one of many types and varieties of jobs (a subassembly in this instance) for which operational descriptions and routings are duplicated in advance. This simple expedient is an indispensable timesaver when setting allowances for recurring jobs of similar type, and when used in this manner both sides of the form serve as a job characteristics record always available for quick reference.

The first step in making the job formula for machining roll heads on a turret lathe was recording time study data on the master table of detail time studies shown in Figure 3. Eight time studies fairly representative of the job-size range were selected as source data. Although the studies were collected over a period of about nine months, the only significant changes in conditions, methods, or equipment were the gradual substitution of carbide tools for high-speed tools with a consequent reduction of machining time.

Since information on the time studies was complete and definite concerning the kinds of tools used, it was a simple task to recompute machining time on the basis of consistent and improved tooling before posting these elements on the master table. Time studies were arranged in order of job size, identified as *S-1*, *S-2*, etc., and posted on the master table in this order instead of chronologically, to simplify and facilitate analysis of the data with respect to the variable functions indicated by preliminary review.

Since the objective was a specific job formula and not a general one, simplification was begun with the posting of elemental data on the master table. Examination of the source

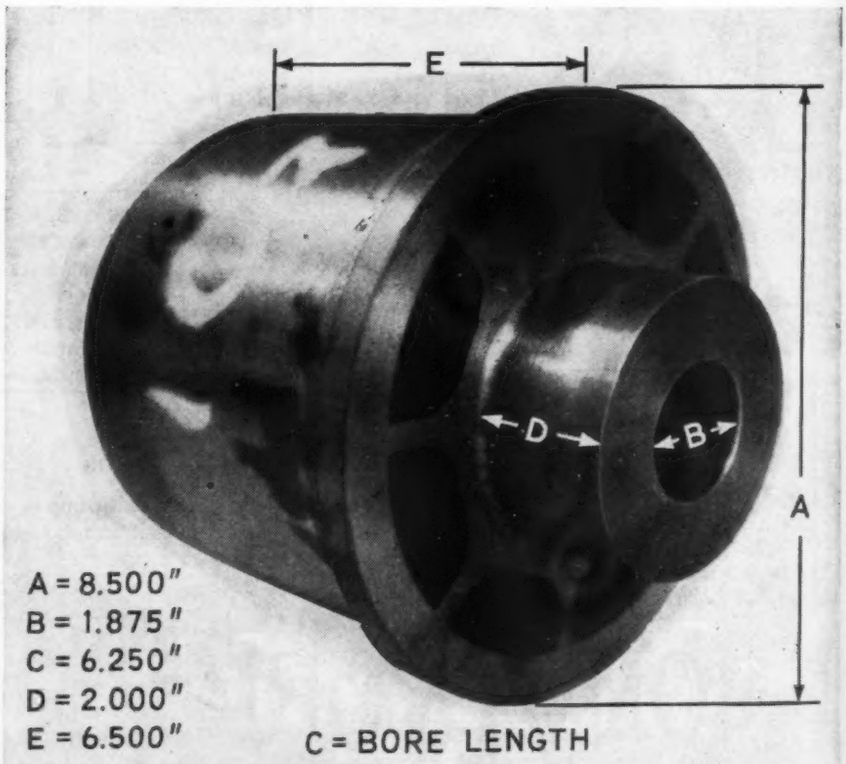


Figure 1. Cast-iron pipe roll head is typical of machining job on which time allowances are established by means of simplified formulas

STANDARD TIME 2

DRAWING TITLE STEEL PIPE ROLL	DRAWING NO.	PATTERN NO. Head
NAME OF PART	MATERIAL Steel Pipe CI Heads - Standard Journals	APPROX. WEIGHT

Operation No.	DESCRIPTION OF OPERATION	Machine Tool and No.	How Set	Standard Time		Department
				Set-up	Each Piece	
1	Saw off pipe (when required)	Saw 76	--			M-76
2	Bore and face pipe	SBM-20	Std.Data	.60		M-20
3	Saw off journal	Saw 76	--	.		M-76
4	Face and center journal	EL-7	Std.Data	.40		L-7
5	Turn head fit on journal	EL-11	Formula	.40		M-11
6	Turn, bore, face, chamfer-Patt. #	TL24-25	Formula	1.25		M-24-25
7	Press in heads and journals	HP-81	Std.Data	.20		M-81
8	Drill, pin, and rivet heads	RD-79	Std.Data	.15		M-79
9	Straighten roll	HP-77	Std.Data	.20		M-77
10	Turn roll on lathe #9	EL-9	Std.Data	.30		L-9
11	Finish turn ends of roll, turn, and chase journals	EL-7-8	Formula	.50		L-7-8
12	File and polish roll					Floor
13	Balance roll, assemble head plates	Floor	Std.Data			Floor
14	Drill and tap __ holes in end of ____ journals	HD-146	Std.Data	.30		M-146
15	Mill keyway	KWC-19	Formula	.30		M-19

DATE SIGNED

Figure 2. Standard time office record shows sequence of operations and routing for making a steel pipe roll. Procedure outlined for simplifying a job formula is based on operation No. 6

studies indicated that job characteristics were comparable and elemental divisions similar throughout. These findings suggested combining time study elements into broader synthetic elements such as "hand part handling," "hoist part handling," "true up," and others appearing on the master table.

After part and machine handling and hand-feed elements were recorded, power-feed machining elements were listed in the order of their occurrence and machining times recomputed where necessary to bring them into consistent relationship with speed of equipment limitations and satisfactory machining practice based on use of carbide tools.

In agreement with the sketch appearing on the master table, machining operations were designated by letters *A*, *B*, *C*, *D*, and *E* for later convenience in trial formula expressions or curves. All variable job dimensions were also posted (in inches) opposite their corresponding letters for reference and analysis. This system of dimensional identification by letters is also followed in Figure 1 and in the sketch appearing on the formula working sheet (Figure 8) or summary of the formula compilation.

A brief review of line 7, subtotals, of the master table (further mention of line number will refer likewise to lines on the master table) suggested that these time values varied approximately with machining element subtotals (line 14) and with totals in inches (line 22) of the five variable machined job dimensions.

Plotting Values

Since the latter relationship appeared to represent a straight-line function, its possibilities were explored first. Time values from line 7 were plotted against job dimension totals from line 22 as shown in the first curve (Figure 4). Although examination of the plotted data here indicated that a straight line (whose slope is represented by $m = 0.0154$ in the form $y = b + mx$) through the two extreme points plotted, *S-1* and *S-8*, might be reasonably acceptable, it was decided to determine the slope of the curve as mathematically influenced by all the data plotted. The equation of the line through the eight points was calculated by the "method of least squares" and may be algebraically expressed by $y = 0 + 0.01385x$.

The graph of this best line appears in the second curve (Figure 5) and was considered satisfactory for inclusion in the final formula expression, since the values given by the curve include all special allowances and above- or below-average elemental values recorded in the original time studies.

The next or third curve (Figure 6) was constructed by plotting machining element subtotals from line 14 against job dimension totals from line 22. This curve also appeared satisfactory for use in the final formula to derive machining-time allowances. The equation of the curve is of the form $y = cx^n$, the rapidly changing slope at the lower extremity reflecting machine-speed limitations for small-bore diameters.

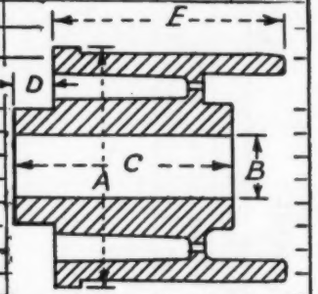
For purposes of comparison and checking, Curve 3 was reduced to its algebraic form by plotting the data to

MASTER TABLE OF DETAIL TIME STUDIES

FORMULA A-11
DATE 1-18-45
PART HEAD FOR PIPE ROLLS
OPERATION TURN, BORE, FACE, & CHAMFER
PERFORMED ON W.& S. TURRET LATHE
COMPILED BY M. H. Young

JOB CHARACTERISTICS

Study	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12
Study	7-11-40	11-22-40	11-11-40	10-1-40	2-16-40	10-12-40	11-1-40	7-9-40				
Operator	SCHEIDT	SCHEIDT	SCHEIDT	SCHEIDT	SCHELTER	SCHEIDT	SCHEIDT	SCHELTER				
DWG. No.	C-6-477	24-661	C-24-644	C-24-611	24-575	C-36-797	C-3-484	C-3-462	TIME STUDIES POSTED			
PATT. No	24428	23923	24344	24653	24471	24416	25108	24201A				
TYPE	RUBB. COV.	STEEL	RUBB. COV.	STEEL	STEEL	RUBB. COV.	RUBB. COV.	BREAST ROLL	IN ORDER OF JOB			
FPM & FD-TURN (AVG)	140-.023	150-.023	178-.023	160-.023	110-.030	160-.023	178-.023	94-.030				
RPM & FD-BORE	150-.0167	150-.0167	150-.0167	150-.0167	178-.0167	150-.0167	150-.0167	70-.030	SIZE			
WEIGHT, LBS	40	53	53	54	81	329	371	515				



Line No.	Operation Description	Reference	Operation Class*	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12
1	HAND PART HANDLING		C	.040	.046	.053									
2	HOIST PART HANDLING		C				.050	.110	.088	.091	.110				
3	TRUE UP		C	.030	.049	.051	.043	.105	.103	.106	.135				
4	TOOL & MACHINE HANDLING		C	.066	.078	.060	.085	.143	.107	.097	.143				
5	PAINT SERIAL NO., CALIPER PIPE, TOOL MAIN., MISC.		C	.068	.065	.075	.094	.077	.107	.097	.112				
6	HAND FEED ELEMENTS, CHAMFER, SQUARE OUT CORNER, ETC.		C	.036	.056	.044	.071	.132	.132	.105	.172				
7	SUBTOTALS		C	.240	.294	.283	.343	.567	.537	.496	.672				
8	MACHINING ELEMENTS:	SEE SKETCH													
9	ROUGH TURN HUB	D	V		.009		.019	.016	.016		.033				
10	ROUGH FACE	A-B	V	.044	.052	.056	.099	.134	.213	.158	.200	TURNING TIME COMPUTED			
11	ROUGH TURN & ROUGH BORE (SIMULTANEOUSLY)	C & E	V	.073	.078	.083	.104	.181	.268	.392	.456	AT 160 FPM, .023" FD.			
12	FINISH TURN	E	V	.061	.059	.068	.111	.178	.233	.280	.328	FINISH BORING TIME			
13	FINISH BORE	C	V	.084	.074	.078	.117	.132	.182	.164	.216	AT 150 RPM, .0167" FD., 2 CUTS,			
14	MACHINING ELEMENT SUBTOTALS			.262	.272	.285	.450	.641	.912	.994	1.233	UP TO 3¾" BORE DIA., OVER 3¾"			
15	TOTALS			.511	.576	.640	.793	1.208	1.449	1.481	1.823	AT 150 FPM			
16	DIMENSIONAL RANGES OF T.S. SOURCE DATA (INCHES)	SEE SKETCH										→ 8.48			
17	MAXIMUM OUTSIDE DIAMETER	A		7.000	7.500	8.625	10.625	12.625	14.000	16.000	18.000				
18	BORE DIAMETER	B		1.500	1.830	2.375	2.720	2.875	3.750	3.750	4.179				
19	BORE LENGTH	C		5.062	4.063	4.250	6.562	7.500	10.312	9.500	11.250				
20	HUB LENGTH	D		—	.812	—	1.500	1.000	1.062	—	1.250				
21	HEAD LENGTH LESS HUB LENGTH	E		6.000	6.250	7.000	8.000	9.000	11.750	12.500	13.000				
22	TOTAL VARIABLE MACHINED JOB DIMENSIONS	A+B+C+D+E		19.562	20.455	22.250	29.407	33.000	40.874	41.750	47.679				
23	NEW VALUES FOR PART MACHINE HANDLING & HAND														
24	FEED ELEMENTS (LINE 7, ABOVE) FROM CURVE 2 (FIG. 6)			.272	.282	.308	.408	.455	.567	.580	.662				
25	NEW VALUES FOR MACHINING ELEMENTS (LINE 14, ABOVE) FROM CURVE 3 (FIG. 7)			.262	.272	.302	.490	.610	.925	.965	1.235				
26	TOTALS, LINES 24 & 25 - USED TO PLOT CURVE 4 FIGURE 8			.534	.554	.610	.898	1.065	1.492	1.545	1.897	8.60			
27	TEST DATA: (SEE COLUMN S9 FOR TOTALS OF COLUMS S-1 THROUGH S-8														
28	EACH-PIECE TIMES FROM CURVE 4			.53	.56	.61	.90	1.06	1.50	1.54	1.90	8.60			
29	PERCENT DEVIATION FROM TIME STUDY VALUES (LINE 15)			+3.5	-3.0	-4.5	+13.0	-12.0	+3.4	+4.0	+4.0	+1.1			
30	APPROXIMATE RANGE OF VARIABLE MACHINED JOB DIMENSIONS (INCHES):														
31	A — FROM 6.1 TO 20.0														
32	B — " 1.3 " 5.0														
33	C — " 4.0 " 12.0														
34	D — " 0.0 " 3.0	*C = CONSTANT													
35	E — " 6.0 " 14.0	V = VARIABLE													
36	TOTAL " 17.4 " 54.0														

Figure 3. Master table of detail time studies is used to record time study data for analysis

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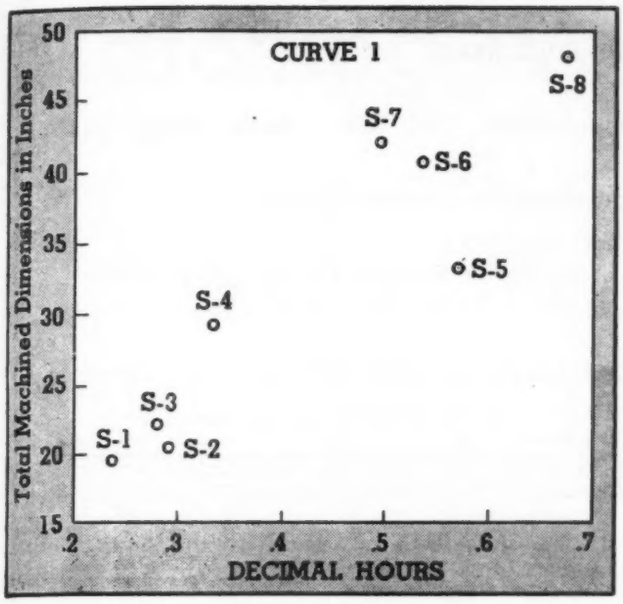


Figure 4. Points on Curve 1 are plotted from data collected on time required for part and machine handling, and hand-feed machining elements of job

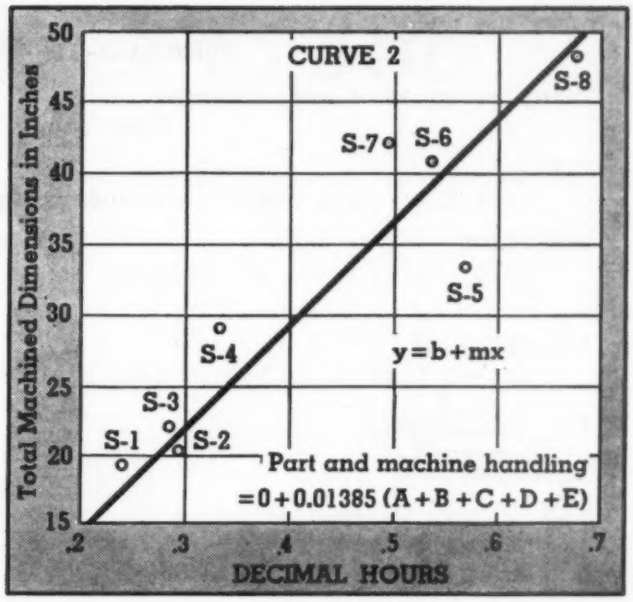


Figure 5. Curve 2 is plotted from the "method of least squares" equation for best straight line through the scattered points plotted on Curve 1

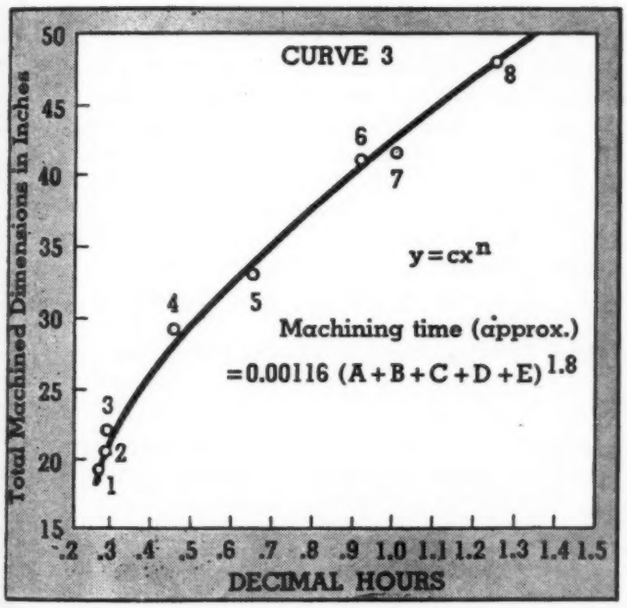


Figure 6. Curve 3 is constructed by plotting data collected on the time required for the power-feed machining elements of the pipe roll head job

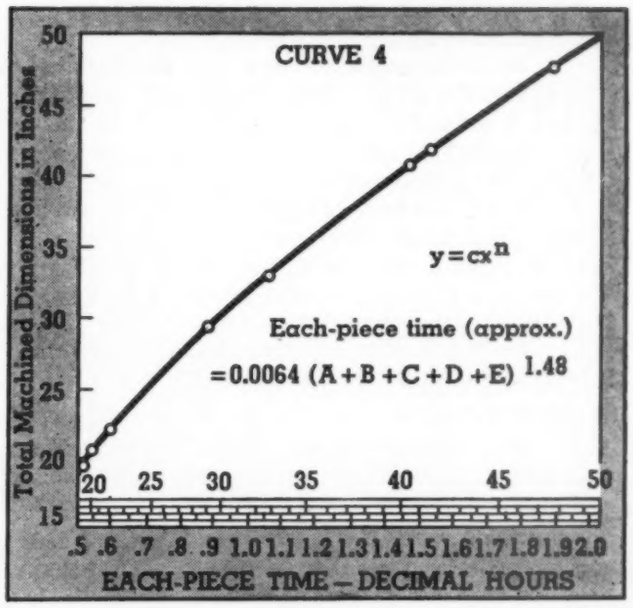


Figure 7. Curve 4 is plotted from sum of time values given by Curves 2 and 3, which is total time required to perform the machining operation

logarithmic coordinates. Two points were selected from the resultant straight-line curve, and logarithmic forms of their equations were written and solved simultaneously to find the numerical values of n and c.

Expressed algebraically, the allowed time for power feed machining elements of the job was found to be approximately $0.00116(A + B + C + D + E)^{1.8}$.

The fourth and final curve (Figure 7) represents the sums (line 26) of time values from the second and third curves, lines 24 and 25 plotted against job-dimension totals from line 22. The data used for drawing Curve 4 were also plotted on logarithmic paper to derive a fairly exact algebraic formula for the total each-piece time. A satisfactory term for this value was determined as $.0064(A + B + C + D + E)^{1.48}$. While this equation can be solved readily enough by slide rule, its use is cumbersome and slow in comparison to reading Curve 4 in its final form.

The horizontal axis of the final curve is then converted into a scalar graph and duplicated on the formula working sheet (Figure 8) as the complete and final formula expression. The scalar graph uses much less space and is easier to read than the original curve form, and is considered better than tabular data since it is almost as quickly and easily read and provides satisfactorily accurate and appreciably easier means of interpolation. The algebraic equation is included with the formula working sheet as a means of extrapolation of the scalar graph if job

FORMULA A-11--PIPE ROLL HEADS

Turn, bore, face and, chamfer

Time Study Department, B-C Div., Mach. Shop, 1-45

PART:

Cast-iron roll heads of standard type shown by sketch below

OPERATION:

Turn, bore, face, and chamfer

WORK STATION:

Warner & Swasey Turret Lathes M-23 (3A), M-24 (3A), M-25 (4A)

ALLOWED TIME:

Set-up time=1.25 hours; each piece time=Curve I, with reference to Figure 1

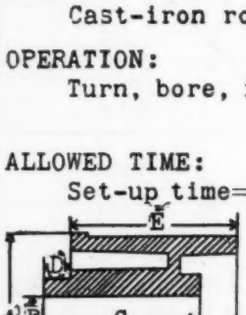
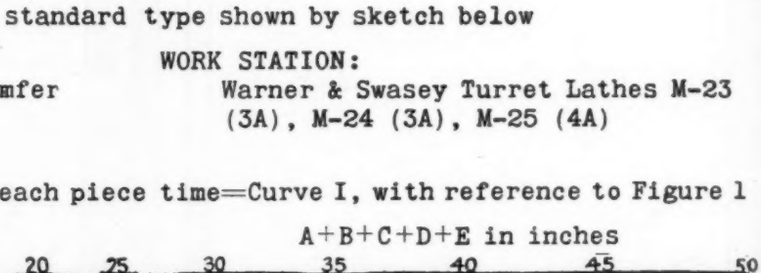


Figure 1



Curve I

Instructions for using Curve I: Above line find sum in inches of maximum head diameter, bore diameter, bore length, hub length, and head length (with reference to Figure 1, the sum of A+B+C+D+E). Opposite this sum below line read allowed each-piece time in hours. (Note: Interpolate logarithmically above line, arithmetically below line.)

APPLICATION:

This formula covers all machining required on roll heads before they are pressed in pipe. One rough and one finish cut and smooth finish required on pipe press fit; one rough and two finish bore cuts and smooth finish required on journal press fit; one cut only required in facing head and hub and turning hub. Slight chamfers required for starting press fits; all rough edges broken.

With sketch (Figure 1) above as reference, Curve I is based on each piece constant plus consistent machining practice, viz., rough as much as possible of A, D, and E during C, at 160 f.p.m. on maximum diameter, 0.023 feed; finish E at 160 f.p.m., 0.023 feed; finish C at 150 r.p.m. up to 3¾-in. bore diameter; over 3¾-in. bore diameter at 150 f.p.m., 0.0167 feed.

Curve I may be extrapolated by use of the formula: Each-piece time (in hours)=$0.0064\ (A+B+C+D+E)^{1.48}$

INSPECTION:

No regular inspection. Operator's responsibility to provide allowance for press fit of head into tube by micrometer measurement of both head and tube. Heads and tube ends identified for assembly by matching serial numbers.

PAYMENT:

Standard-time job basis.

Approved:

M. H. Young
Time Study Supervisor

M. H. Young
Time Study Department

Figure 8. Formula working sheet for machining pipe roll heads contains scalar graph which is easier to read than the original curve form. To establish a time allowance one reads sum of $A + B + C + D + E$ (32 inches in this case) above scalar axis and time allowance of 1.01 hours directly below it

dimension totals should in some rare instance exceed its range.

In addition to checking the values from source time studies against values set on the same jobs by the formula, with results shown by lines 28 and 29 on the master table, satisfactory results were obtained through comparisons with other representative time study values and with several over-all checks.

To establish a time allowance for machining a typical roll head having, for example, the dimensions

A = 11.25 inches
B = 2.75 inches
C = 8.00 inches
D = 1.50 inches
E = 8.50 inches

it is only necessary to read the sum of $A+B+C+D+E$ (32 inches) above the scalar axis and the time allowance of 1.01 hours directly below it. With the aid of an adding machine, job dimensions are totaled from the blueprint, and the time required to determine the allowance is but a few seconds.

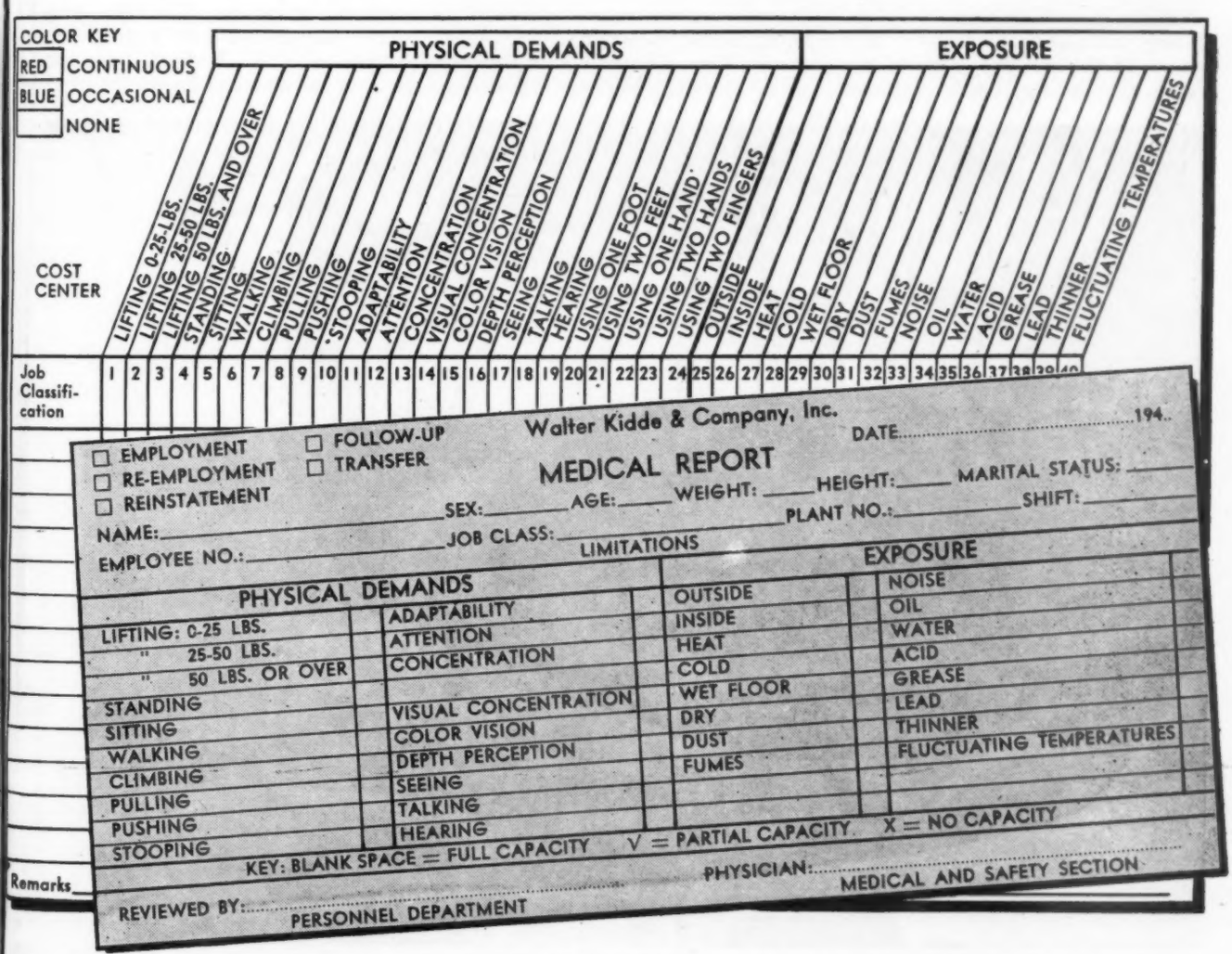
Matching Worker to Job

THE MOST EFFICIENT PLACEMENT of workers is accomplished when it is recognized that all individuals possess limitations in relation to one job or another, in the opinion of top management of Walter Kidde & Company, Belleville, N. J. These limitations may be mental, physical, or temperamental, and their importance can be gaged only when matched against specific job demands.

In order to place its employees most effectively, Walter Kidde & Company has devised a system for the protection of both the worker and the company. Focusing on the positive qualifications of the individual, rather than a negative consideration of his disabilities, the plan allows any employee to be placed to the utmost advantage, and permits sufficient interchange of duties for the physically handicapped to put him on an employment par with those whose limitations pertain to intellect, temperament, or training alone.

This system comprises a breakdown of the physical and mental capacities of the individual, and also the physical, mental, and environmental demands of each job, expressed in similar terms and charted as separate components on two forms, as illustrated. It will be noted that the listing of personal qualifications in terms of job requirements, rather than as medical estimates, precludes any breach of medical confidence. However, it enables the prospective worker's ability to lift specified weights, stoop, concentrate, withstand cold or wet or exposure to fluctuating temperatures, grease, acids, etc., to be indicated in detail. A blank space indicates full capacity, a check-mark partial capacity, and a cross no capacity whatever. On the job demands chart, the same components are checked in red where the demand is continuous, blue where it is occasional, and left blank where there is none.

The procedure is as follows: An applicant is first interviewed by the personnel department and, if considered acceptable, he is referred to the medical department for examination. Here the chart of his capacities is filled out. He then takes it back to the personnel department where it is matched against the breakdown charts of the specific job or jobs for which he is being considered. If a match is not achieved, every effort is made to find another type of job which the applicant is qualified to handle.



The same information is carried on the workers' medical report as on the job analysis form. No worker is given a job he cannot handle because of physical, mental or temperamental disabilities

Tighter Defense Against Occupational Disease

IMPROVED SAFEGUARDS against occupational diseases are among the gains of greatest interest to industry which may be credited to the war. Especially noteworthy is the work done by medical and other scientific experts on the staff of the Army's Air Technical Service Command.

In ATSC the fight against occupational disease is exceptionally broad because this unit is the largest employer of civilian workers in the Army. The ATSC is the branch of the Army Air Forces charged with developing, procuring, supplying, and maintaining Army aircraft. To do this during the war, ATSC employed approximately 200,000 civilians.

Industry has long been active in fighting occupational disease. But because of the size and scope of the ATSC, this military unit's industrial medical program is probably the most elaborate in the country. Under its procedures, all machinery and installations used by the 200,000 employees were surveyed to detect health hazards, and are inspected continuously.

Workers are provided with protective clothing, shields, lotions, sprays, and baths. Proper ventilation systems have been installed to reduce respiratory dangers. All employees are given periodic physical examinations to detect the symptoms of occupational disease. Workers showing such symptoms are immediately shifted away from the hazard, and immediate steps are taken to reduce or eliminate it.

In each of the fourteen huge supply and maintenance centers operated under the ATSC, the program is directed by a qualified medical officer, assisted by an industrial hygiene engineering officer, both trained and experienced in the industrial medical field.

Most elaborate of the precautions taken for protection of workers' health were those in the radium dial-painting departments of the instrument repair shops. Here groups of girls work 8 hours daily at the same job which brought slow death to scores of less carefully protected workers who coated dials with radium paint in the last World War.

This time the painters work over glass-enclosed cabinets which permit only their hands in the cabinets. Blowers attached to the cabinets exhaust the air at 100 cubic feet per minute, removing deadly radon gas which is generated by radium. The lower parts of the cabinets are lined with lead to prevent radiation. Radium stores also are shut off in a lead-lined cabinet.

Poisonous welding fumes are removed by air intake pipes of a flexible tubing shaped like "elephant trunks" to permit adjustment. Air-intake speed for this purpose is maintained at 50 miles an hour

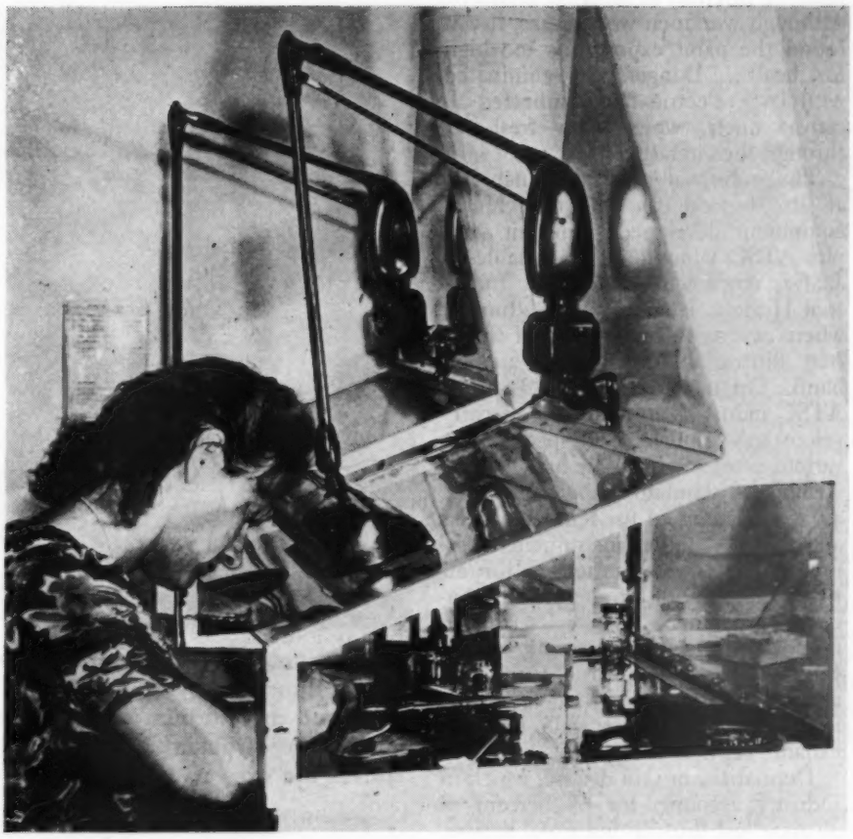
In the last war deadly doses of radium were unwittingly received when workers placed the tips of their paint brushes in their mouths to make the painting more precise. Now, ATSC supervisors watch the painters like hawks, paying particular attention to their hands. Not even biting of fingernails or head scratching is permitted. Employees are not allowed to eat on the job, and are required to wash their hands frequently.

Next to the workrooms, darkrooms with ultra-violet ray spotlights are operated. Here the girls are required to examine their hands, hair, and clothing for radium particles. No one can leave the workroom without a darkroom examination. In addition, at the close of the shift all the workers are required to take a shower before leaving the building.

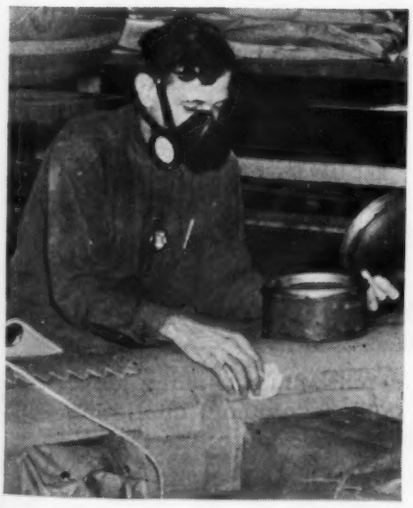
Special Examination

When new employees apply for work, they receive a special physical examination. No applicants with open cuts or dental cavities are permitted to become radium-paint workers.

Despite these precautions, ATSC tests its radium painters every two months to make certain the percentage of radium in their bodies is far below the danger level. Breath samples are taken and sent to the Bureau of Standards in Washington, D. C., for measurement of radon gas, which indicates presence of radium in the body. If the test shows presence of more than one-tenth of a microgram of radium, the worker is transferred to another assignment until the radium indicative returns to a safe level. A microgram is a millionth of a gram. So sensitive is the test that the air in the industrial hygiene officers' collecting rooms generally shows radio-activity and has to be tested before breath samples are taken.



Elaborate precautions against radium poisoning for workers using luminous paint include provision of lead-bottom work cabinets with glass top and sides. Only the worker's hands are permitted to enter. To keep cabinet free from deadly radon gas, exhaust pipes draw air across danger spot at rate of 100 cubic feet per minute



Gas masks are used as protection against fumes from certain volatile solvents. Where rubber gloves cannot be used to protect the hands, as from talc dust which sometimes causes dermatitis, the application of skin creams is required as a protective measure

Throughout the repair buildings and overhaul hangars all processes where fumes are released are attached to powerful exhaust blowers. Carbon removal tanks, containing solvents, are attached to huge 15-hp. blowers. Where possible, processes are enclosed.

Sandblasting, a frequent cause of silicosis in industry, is carried on in glass-enclosed booths where only the rubber covered hands of the workers are exposed to silica and lead dust.

In a routine check-up at the Mobile, Ala., ATSC, it was found that air samples from sandblasting booths contained a high percentage of lead. This came from carbon deposits on cylinders and pistons which were cleaned by sandblasting. There were no cases of lead poisoning, though, thanks to local exhaust pipes connected to all sandblast booths. As an extra precaution, sandblast operators are examined at regular intervals for early symptoms of lead poisoning or silicosis.

X-ray is used to test for invisible flaws in aircraft construction. Workers close to this process wear an instrument which measures the amount of radiation to insure against over exposure to X-ray, which can be deadly.

All spray painting and "doping" is done in front of water-wash spray baths to draw excess paint or dope spray away from the operators.

Although welding and cutting of ordinary steels are harmless from a toxic standpoint, with stainless steel, galvanized-zinc metal and aluminum, or metal coated with lead containing carbon, the fumes may be poisonous. Under ATSC rules, strong air intake of local exhaust pipes is used to draw off the fumes. Portable exhaust machines also are employed, where a regular exhaust system is not available. If the welding or cutting occurs in a small, confined space, masks are worn.

Often new protective measures must be devised for new processes or situations. One project at the San Bernardino, Calif., ATSC, involves re-

painting interiors of medium bombers. Although workmen wear masks, it was found the paint exposure is too high for health. Danger was eliminated with large electric fans connected to canvas ducts, which blow fresh air through the aircraft.

The industrial medical branch has at its disposal the finest technical equipment developed. Any air samples ATSC laboratories are unable to analyze are flown to the Army Industrial Hygiene laboratory at Baltimore, where experts in every phase of industrial disease and toxicology are on hand. On tours of their fields, most ATSC industrial hygiene officers carry velometers to measure air speed where various gases and dusts are drawn away. A table of standards shows them the air speeds required for removing gases and dusts. Another instrument measures solvent concentration in the air to one-hundredth of 1 percent. Another instrument used is a carbon monoxide indicator measuring to one-thousandth of 1 percent. If one-hundredth of 1 percent carbon monoxide is indicated, the officer calls for local exhaust ventilation.

Dermatitis, or skin disease, which in industry accounts for 65 percent of all time lost through industrial disease, has been virtually eliminated in ATSC plants through enclosing of processes, and use of rubber gloves, special soaps, and hand creams. Besides hand creams that resist solvents, workers finish the day with a cream that resembles high-class cold cream.

An Important Role

There have been many dramatic proofs of the vital part played by industrial medical officers in keeping AAF planes flying against the enemy.

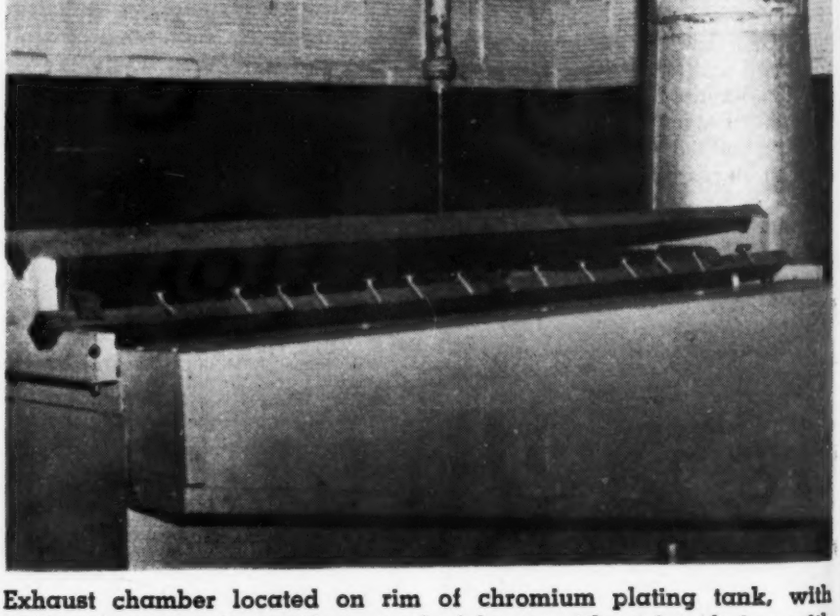
ATSC was given the job of making a quick modification on the B-29 Superfortress—an improvement which combat experience proved was necessary for more efficient performance. The modification involved the use of magnesium welding. Magnesium fumes affect the nervous system. Welders employed on the job began to feel ill effects. They began to have tremors and tire easily.

Industrial medical experts were called in. They diagnosed the situation, and prescribed special ventilating equipment to carry fumes away from the welders. The equipment was installed and the modification was completed on time.

What can happen without proper industrial medicine safeguards was observed some time ago at the Fairfield, Ohio, ATSC. Battle-weary B-17s were being cleaned inside and out. Carbon tetrachloride was used on the upholstery. Carbon tetrachloride fumes are injurious to anyone who inhales them in quantity. Normally, the use of this chemical indoors without proper ventilation is forbidden, but since the B-17s were outside, precautions were not followed. Inside the cabins of the bombers, however, the fumes were even more injurious than inside a shop or hangar. By the end of the first day, there were nine stretcher cases among workers engaged in the cleaning process.

All work was halted and the industrial medical experts went to work. They developed a small portable ventilating unit similar to a vacuum cleaner. It did the trick, and the work was resumed.

Breath samples provide one of several methods used by the Army's Air Technical Service Command to find out whether workers have absorbed any radium emanations. Any test showing one-tenth of a microgram of absorption, although this is far below the danger point, causes the worker to be transferred to other duties



Exhaust chamber located on rim of chromium plating tank, with 1¾-in. slots, permits rapid removal of fumes without interfering with easy access for handling of products into and out of the tank

Merit Rating System for Supervisors

C. K. HAAS, Personnel Director, Inland Manufacturing Division, General Motors Corporation, Dayton

MERIT RATING for supervisory employees at the Inland Manufacturing Division of General Motors Corporation, has demonstrated a number of beneficial results, both on behalf of top management, and on behalf of the supervisory force.

As used at Inland, the system measures on a percentage scale the degree of efficiency of each supervisor according to ten main types of qualifications for his present job, classifies his promotional possibilities, and shows any categories in which further improvement of the individual is needed for his present job or for promotion.

Ratings are made at 6-month intervals. In addition to the reports being studied by top management, each supervisor is allowed to see a copy of his own rating and recommendations.

Principal benefits of the system at Inland are as follows:

1. It provides top management with an accurate measurement of the ability of each supervisor in his present job, thus indicating where supervision is good, and also where improvement is needed.

2. It provides the individual supervisor with the same accurate measurement of his own strengths and weaknesses, and thus shows him the direction in which he will benefit most from efforts for self-improvement.

3. It shows the individual supervisor that his virtues have been observed by top management, as well as his faults, and thus provides him with added confidence in top management's fair dealing.

4. It tends to weed out any incompetent supervisors, to lift the standards of those who remain, and thus tends to improve the response of other employees below the supervisor level.

5. It tends to produce a superior crop of supervisors for further promotion, and is a reliable guide to top management in making such choice.

The present system of rating at this company is a product of research and gradual revision. First, the ten pertinent qualifications which are considered significant in the performance of a foreman's duties were listed as shown in first column of Figure 1. Effort was made to include all important factors, and at the same time to make each qualification exclusive.

Definite Categories

Descriptive phrases were drawn up to facilitate uniform understanding of the qualifications. These phrases range from the best performance to the worst, and place the person rated in a definite category with a percentage value of 10 down to 1. To assist the examiner in determining the exact value, a list of 100 descriptive phrases suggesting special points for him to consider are available for his reference at the time each rating is made.

Since there are ten quality factors listed, and since a maximum of ten percentage points are provided for each qualification, the conventional method of rating on the basis of 100 percent is quite suitable for general purposes. However, with the realization that various lines of supervision make greater demands on certain qualifications than do other lines, Inland plans eventually to make provision in the rating form for such irregularity. For example, the foreman in the factory has a greater responsibility in giving proper instructions on the rules of safety than the supervisor in the office, where hazards are less likely to influence those in his charge. Therefore a greater percentage value should be given the qualification of safety procedure in departments where it is more pertinent. In like manner, other qualifications should be evaluated according to the relative importance they have in the individual type of work in which the employee is engaged.

However, experimentation with the present rating form is planned before

Informal discussion with his immediate "higher-up" helps every supervisor find out where he stands, what he can do to improve

Inland Manufacturing Division—General Motors Corporation

EXEMPT EMPLOYEE'S RATING REPORT

Employee's Name John Doe Date May 21, 1945

Department Punch Press Position Foreman Shift 11 p.m. - 7 a.m.

1. ABILITY TO DO PRESENT JOB

QUALIFICATIONS	RATINGS					Percent
1. Consider employee's interest in his job and company	Enthusiastic; interest is contagious	Generally a booster; interested	Satisfied; not disloyal	Usually dissatisfied	Antagonistic; lacks interest	9
		X				
2. Consider his ability on job relations; his handling of personnel problems and grievances	Expert; handles problems with tact and diplomacy	Usually handles problems with tact and diplomacy	Occasionally needs to be guided in handling problems	Frequently makes decisions without sufficient evidence	Seriously lacking in judgment and tact	6
			X			
3. Consider employee's ability and interest in instructing those under him on job knowledge and good safety habits	Active interest; conscientious, thorough; follows up	Normal interest; well informed and effective	Interested, but is not very convincing or effective	Little interested in training or safety	Altogether indifferent	8
		X				
4. Consider employee's knowledge of his job	Expert on his job; knows related jobs	Well informed; good experience	Has a fair working knowledge of job	Needs coaching	Altogether inadequate	8
		X				
5. Consider his success in going ahead with jobs assigned without being given every detail; his ability to make job improvements and to get jobs lined up	Very resourceful; has initiative and ability; improves standards	Resourceful and efficient; plans work	Usually meets standards	Needs urging	Unsatisfactory	7
			X			
6. Consider employee's judgment in scheduling his work and meeting his deadlines	Unusually mature judgment	Good judgment	Fair amount of common sense	Makes immature decisions	Seriously lacking in judgment	8
		X				
7. Consider employee's industry on job	Does more than is assigned	Does all that is assigned	Generally meets requirements	Rarely meets requirements	Lazy; never meets requirements	9
		X				
8. Consider his reliability in meeting his responsibilities	Dependable, conscientious	Needs little supervision	Needs normal supervision	Needs close supervision	Distinctly unreliable	8
		X				
9. Consider employee's ability for leadership	Excellent natural leader	Takes lead most of time	Takes lead if pushed	Dodges opportunity to lead	Shows no qualities of leadership	8
		X				
10. Consider his ability to cooperate with other departments and other supervision	Highly cooperative	Cooperative	Cooperates if urged	Not helpful	Prevents progress	8
		X				

(OVER) Total Rating 79B

Figure 1. Form on which supervisory employees at Inland Manufacturing Division of General Motors are rated on ability to do present jobs divides their qualifications into ten sections. Each supervisor is rated by head of his own department who places an X beside statement that most nearly describes rated man's ability. Position of marks also shows its percentage value from a maximum of 10 on down to 1. Points shown in final column are added to indicate the supervisor's general standing

II. PROMOTIONAL POSSIBILITIES

Answer only one of the following — A, B, or C.

CLASS A – READY FOR ADVANCEMENT, WITH LITTLE OR NO TRAINING AND ADJUSTMENT.

☐ Position to which he is ready to advance ..... Special qualifications .....

CLASS B – SATISFACTORY FOR PRESENT WORK, BUT IS NOT READY FOR ADVANCEMENT

☒ Chief limitations for advancement Needs more training in all phases of present job.

Special training which would be advisable See "Remarks" below.

CLASS C – UNSATISFACTORY IN PRESENT WORK

☐ Chief defects ..... How can situation be remedied .....

What work might he be fitted for .....

EFFORT TOWARD SELF-DEVELOPMENT:

What is he doing to fit himself for a more responsible position (Home study, special courses, etc.)
All classes available in plant evening training program in his field.

Is he learning the duties of the position above him Yes

To what position or type of work does he aspire General Foreman

IS EMPLOYEE'S ATTENDANCE SO IRREGULAR THAT IT HARMS HIS JOB? Yes ..... No X

IS EMPLOYEE'S CONDUCT OFF THE JOB SUBJECT TO ADVERSE CRITICISM, WHICH WILL AFFECT INLAND? Yes ..... No X If yes, explain .....

DOES THE EMPLOYEE HAVE ANY PHYSICAL DEFECTS WHICH AFFECT THE PERFORMANCE OF HIS RESPONSIBILITIES? None

REMARKS: Needs more training through experience on the general problems pertaining to present work, plus additional study in tool design and general machine shop.

SIGNATURES

Supervisor or General Foreman John Brown /s/ Division Head A. K. Johnson /s/

Superintendent J. S. Smith /s/ Employee John Doe /s/

This report is CONFIDENTIAL, and should be respected as such.

Figure 2. A supplementary form is used to show the promotional possibilities of each supervisor. To decide in which class the supervisor belongs the departmental head who makes the analysis refers to a list of about 100 brief statements which describe attributes indicative of each category. The rated man is shown a copy which he signs after he has discussed it with the department head

these further adjustments are made. To distribute percentage values on the experiments of other plants might be illogical because of individual variations; to base the values on generalities without definite and well-directed investigation would be unsound. Thus, after a working knowledge of the individual rating form, and after consultation with the various department heads, Inland will re-evaluate each qualification so that it will have a percentage value related to its importance in the type of work of the employee being rated.

The rating of supervisory employees in their performance of present jobs answers the need of both management and individual to a certain extent. However, to facilitate fair promotions or demotions on the part of supervision, and to let the employee know just what his possibilities are, a supplementary form rating was added. In this, the "examiner" further grades the supervisor as (a) ready for advancement, with little or no additional training or adjustment; (b) satisfactory for present work, but not ready for advancement, or (c) unsatisfactory in present work.

For appraising the promotional possibilities of supervisors, the examiners are able to make reference to a detailed set of printed suggestions. For example, the examiner is reminded that a Class A employee "need not have already acquired all the job knowledge that is needed in performing the

duties of a more responsible job. However, "his past performance should give reasonable assurances of his ability to assume or acquire the qualifications needed to fill the job."

Similarly, the examiner is reminded that among the reasons for which a supervisor may be graded for promotion as *Class B* is that although he may be "highly satisfactory on his present job and have excellent promotional possibilities for the future," it may be that the "seasoning period necessary for the development of these possibilities will take some time."

Under the heading of *Class C*, the suggestions include: "An employee may be unsatisfactory on his present job but may have special training along specific lines that would qualify him for another job, to the benefit of both the plant and the employee."

Thus, Inland's rating report includes the two major factors of interest to the individual employee and to the members of top management. It is concerned, not only with present performance, but also with promotional possibilities. Variations of individual judgment are limited, thus permitting more standardization of the report, and assuring fairness to the employee.

However, with all the study and research which has been done to make the rating report efficient and serviceable, it is agreed that the system would fall short of the mark if the ratings were not discussed with the employee concerned. Merely to classify a man according to his ability to do his job is not necessarily stimulating to progress, according to the view at Inland. This company believes that if a man deserves credit on his rating form, he deserves verbal expression to encourage him to greater improvement; if a man is definitely failing in certain qualifications, he should be told of the factors that hinder his progress. Accordingly the form on which the rating is written has a space for the employee's signature, which is entered after a talk with the supervisor.

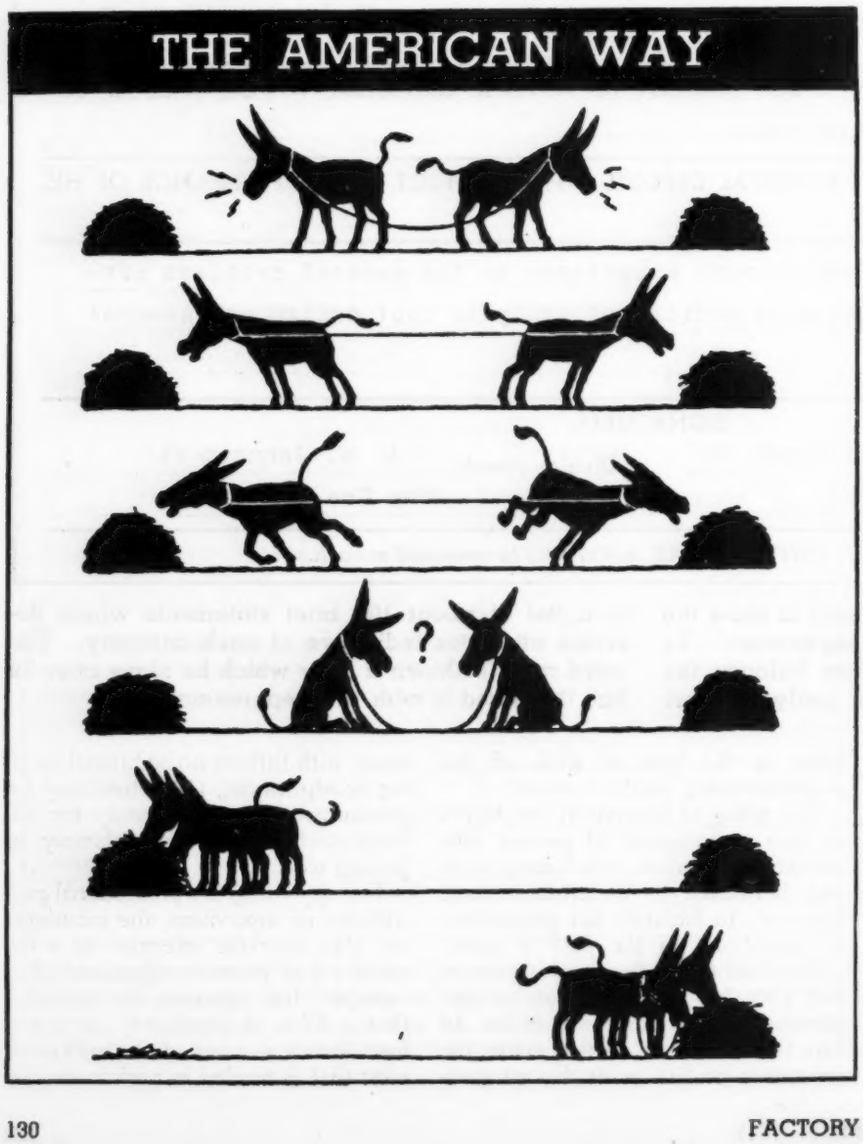
But before the department head who does the rating discusses the report with the employe, he must obtain approvals from the superintendent and the head of the division. This allows the members of top management to get a periodic check on the merits of all supervisors and to keep themselves posted on potential possibilities for promotion. To assure regular contact with the progress of each supervisor, the rating report is made every six months, and these reports are filed.

One factor often overlooked in the smooth functioning of a rating system is the method of filing the ratings for future reference. In this case, the personnel department maintains a master file for upgrading purposes, while the original form is placed in a booklet which is retained in the files of the department head. These booklets containing the ratings of supervisory employees have considerable information, other than rating reports, which proves valuable in getting the facts. The portrait of the individual, his name, address, telephone number, date and place of birth, marital status, draft classification, his education and training background, and a detailed account of his work experience—all these aids in knowing the man are kept in a folder encased in a simulated leather binding and designed for use over a period of years. Provision is made to record any significant factors which reflect outstanding merit or achievement on the part of the employee, and this information, too, is kept in his permanent folder file. The complete contents of this file are marked "confidential."

All Concerned Had a Hand

A noteworthy element in Inland's rating report is that it was devised not by the personnel department alone, but by all the men who use the report. The assistant factory manager, superintendents, general foremen, and supervisors discussed the various angles of rating. From this group, a committee was selected to study the problem. The results of the study were presented in classes in which all supervisory employees participated. In this way the program was "sold" to all the people concerned.

Inland realizes that even the best rating form will have defects, because the human element always enters and the personal standards of the rater will sometimes influence his judgment. The company has attempted, however, by research and by consultation with every man concerned, to eliminate these factors. It is convinced that the benefits of the system are many, both to the company and to the employees.



MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting Out-of-the-ordinary management accomplishments. Accepted articles will be paid for

Use of this special machine designed by Weatherhead engineers adds assembly line methods to soldering operations, speeds up production, and eliminates bottlenecks. Two operators solder 40 to 50 cylinders a minute.

Soldering Operation Simplified

Work simplification principles applied to the soldering of refrigeration cylinders at The Weatherhead Company, Cleveland, have eliminated seven of the steps in the operation.

The new method makes use of a circular jig holding a dozen or more of the cylinders. The turntable of the jig is set upon a unit of three meshed gears which revolve the jig in such a manner that each successive revolution or notch of revolution drops the cylinders a little lower and also revolves the cylinder so that all sides of the soldered joint are treated by the heat. The last step revolves the cylinder completely and the entire product is cooled by a stream of water.

The initial operation consists of smearing the assembly cylinder head with the soldering flux. The continually moving jig then moves the series of cylinders so that the part to be soldered comes into contact for about one second with four gas flames, one after the other. These flames are directed to the cylinder tops, each succeeding flame being slightly larger than the one before.

The various types of solder used determine the degrees of heat for the flames. In some cases three instead of the entire four flames are played on the cylinder because of the type of metal to be joined and the type of flux used.

By using two operators, one to assemble the setscrews, washers, and cylinders, and another to remove and test the soldered joint, production is speeded up to a rate of 40 to 50 perfectly soldered cylinders per minute.

Between the two operators something like 40 minutes of labor is saved in every dozen cylinders thus assembled and soldered. Seven distinct operations are done away with, and the entire job of soldering is reduced to a quick, routine operation.

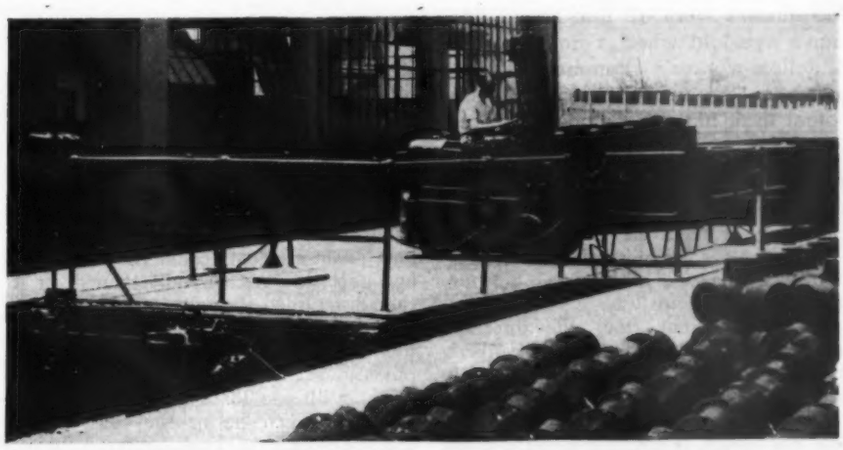
•

A health menu contest for employees not only eased the lot of the menu planner at Thompson Products, Cleveland—it also encouraged the sale of high-vitamin, low-cost meals. Winners get $5, and a free meal for themselves and three guests.

•

Bridge on Wheels Saves Trucking Time

Speeding up production while cutting down transportation time and expense between raw material storage and plant production line, bridge car shown below at a plant of Curtiss-Wright Corporation, Propeller Division, provides a short cut by closing the railroad gap between the platforms at the receiving dock. It was improvised by the plant's engineering department from a regular railway flat car at a cost of about $400. The bridge car has pipe guard railings all around, and two hinged-plate drawbridges which meet the platforms on each side. Whenever incoming freight cars need to clear through this trackage, the drawbridges are turned up before the car is moved and until it is shunted back to its usual loca-



Bridge car, improvised from railway flat car, closes gap between receiving dock platforms, has drawbridges for times when tracks are needed

tion. The bridge car is used regularly by fork lift trucks to carry propeller hubs from receiving into the production lines.

•

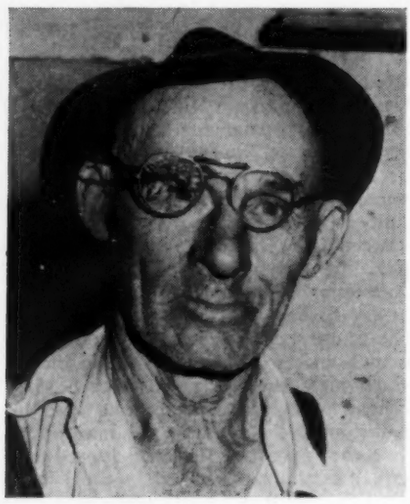
At Kropp Forge Company, Cicero, Ill., a sign is hung across the overhead traveling crane in the machine shop, reading, "Upon production hinges our job—otherwise our competitors will take the jobs at lower costs"

•

Photograph Teaches Safety Lesson

Better than any safety poster it ever used, says The Four Wheel Drive Auto Company, Clintonville, Wis., is the accompanying photograph. It shows one employee of the company who thanks his lucky stars (and the constant efforts of the safety department) that he was wearing his safety glasses the day a freak accident nearly cost him the sight of his right eye.

The man is employed in the crating



The glasses were all that saved this man's eyesight when a nail flew off a fellow-worker's hammer. Photograph of the near-accident is more potent than any safety poster

department. The accident occurred when a nail glanced off a fellow-worker's hammer, flew through the air, and pierced the right lens of his glasses, coming to rest at the side of his head but not injuring him in any way.

It was apparent from the direction of the flight of the nail that the worker's eyeball would have been penetrated had it not been for the safety glasses. The force of the nail is indicated by the fact that the lenses of the glasses were made to sustain the drop of a $\frac{7}{8}$-in. steel ball from a height of 50 inches.

All "bosses" in Boeing Aircraft Company shops wear their titles in big letters across their backs. They are easily spotted by executive or worker

Supervisors Are Easily Identified

"Which one of your men is the general foreman around here?" This question never has to be asked in any of the Boeing Aircraft Company's plants, whether the person seeking the information is a company executive, a plant visitor, or a new employee.

All Boeing general foremen, foremen and assistant foremen are clearly identified by trim white shirts, coats or jackets, which carry their titles in large letters on the back. A general foreman's title is in blue letters, a foreman's in red, and an assistant foreman's in green—each matching the color inserts that cover the lower half of their regular employee identification buttons.

•

Inside Truck Operators Are Thoroughly Trained

To show that the wearers are thoroughly conversant with the "rules of the road," men and women who operate the inside trucks at The Glenn L. Martin Company's plants in Baltimore have been given "qualified operator" badges to wear inside their normal badges.

Used to carry materials from place to place, the 80 trucks in these plants travel 1,000,000 miles a year. It is easy to see how many accidents could occur if truck operators were not carefully trained, or if they disregarded the rules.

The training given Martin truck operators is extensive. Following a thorough physical examination each applicant is given an "Inside Transportation Operator's Manual" which he or she must study, and on which an examination is based. When the examination is successfully passed, the would-be operator is assigned to a particular type of vehicle and given 3 to 5 days' instruction by an expert teacher.

After this the trainee is ready for actual practice, done outside of crowded areas. When, finally, he is deemed sufficiently familiar with his vehicle and its actual operation, he is given an examination in the presence of the transportation head and a safety department representative.

In addition to these precautionary measures, members of the transportation and safety departments hold a "traffic court" once a month, at which accidents are analyzed.

An unusual addition to the service flag displayed by Electric Storage Battery Company, Philadelphia, is the honorable discharge insigne, showing the number of veterans who have already returned

MAINTENANCE SERVICES

The well-maintained plant is the high-production plant

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

CONTENTS OF THIS SECTION

Editorials 134
Planning Machine Moves ..... *H. M. Bradley* 135
Standardized Factory Facilities ..... *Robert MacLatchie* 139
(Plant Operation Library No. 90)
How to Install and Maintain Electronic Controls (Part 1) *H. L. Palmer* 147
Inspection Plan Improves Plant Housekeeping ..... *V. McCabe* 150
City Foremen Boss Plant Protection Program ..... *Howard L. Fleck* 152
Low-Cost Battery Charging ..... *Walter B. Atchinson* 155
Preventive Maintenance Cuts Downtime 87 Percent ..... *J. F. Boyd* 156
Welding Equipment 160
Maintenance Shorts 164
Data Sheets: Causes of Defects When Welding Stainless Steels... 168
What's New in Equipment 172
Catalog Service 314

MAINTENANCE CONTENTS OF THE THREE PRECEDING ISSUES

AUGUST

Provide Management controls 164
Case of Dravo Corporation

SEPTEMBER

Production Methods Applied to Plant Maintenance *R. F. Bartlett* 133
Service Methods That Cut Fluorescent Lighting Cost *Joseph W. St. Andre* 136
Planning Whether to Repair, Replace, or Add *F. R. Weaver and H. C. Atkins, Jr.* 140
Attendance Chart Spurs Maintenance Efforts.. *Wiley Craig* 142
War Production Committee Lends Aid to Maintenance *V. H. Verby* 143
How to Plan Plant Distribution Systems ..... *D. L. Beeman* 145
Clean Equipment Safely ..... *W. H. Easton* 150
Snow Removal Methods That Keep Plants Open *James Montagnes* 152
Unit Heaters and Ventilating Equipment 156
Maintenance Shorts 160
Data Sheets: Connection Diagrams for Electrical Instruments 164
What's New in Equipment 168
Catalog Service 290

OCTOBER

Modernizing an Old Plant for Low-Cost Production *Fleming W. Johnson* 143
Foremen Schedule Their Own Maintenance Work *Elmer A. Munson* 148
Better Welding Grounds Shop Shock Hazards *A. S. Durkie and K. G. Millington* 150
Third-Shift Repairs Save Machine Downtime.. *W. L. Georgen* 152
The Cost of Maintenance in Seventy-Five Industries following page 152
Saving With Rechargeable Flashlight Batteries.. *M. A. Raney* 153
Now Cleans Floors Faster ..... *Victor C. Hoffman* 154
How to Make Insulation Resistance Measurements *Graham Lee Moses* 156
Mechanical Power Transmission Equipment 162
Maintenance Shorts 164
Data Sheets: Driven Shaft Speeds 168
What's New in Equipment 172
Catalog Service 322

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McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York 18, N. Y.

Director of Circulation:
Change my address on Factory Management and Maintenance

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New Title or Position .....

FACTORY MANAGEMENT AND MAINTENANCE
McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42nd STREET, NEW YORK 18, N. Y.

MAINTENANCE as the Editors See It

Don't Risk Dollars to Save Pennies

CAN'T SOME OF THESE LAMPS be turned off? Is it necessary to inspect equipment so often? Couldn't you get along with a smaller budget? Some maintenance executives will have to figure out convincing answers to these questions and others like them, or else permit, by default, the adoption of unwise measures designed to cut costs.

Reduction of production costs is a necessary and highly laudable undertaking, but it must always be remembered that there are bad as well as good ways of shaving these costs.

Turning off lamps that are not needed is a good way to reduce some costs. Cutting down the intensity of illumination in working areas is virtually certain to be a thoroughly bad way to try to save a few dollars. The maximum possible saving cannot be large. On the other hand, it is universal experience that when factory lighting is raised to adequate levels the quantity and quality of production increase, worker morale rises, rejects, accidents go down. Why, then, risk dollars to save pennies?

Intervals between inspections, of course, can be extended almost indefinitely, for a time. But it can be done only at the risk of costly trouble later on.

Maintenance budgets can be cut drastically, of course, but the plant will suffer in many ways.

There are lots of ways in which operating and maintenance costs can be reduced, at least temporarily. But some of the expedients involved can produce, at best, only trifling savings. Others almost certainly will lead to expenditures later on that may be many times the initial saving.

Maintenance executives must be prepared to resist vigorously any so-called economy measures that their experience shows them are ill-advised.

Many Maintenance Men Need More Training

A PRACTICAL, but thoroughgoing, course on electrical control equipment is the solution that one large plant found for the problem of keeping vital machines in service. In this plant there are many rather complicated controls that are largely automatic in operation. Practically all make use of electron tubes.

The plant electricians, on the whole, are experienced and competent to do any required work on magnetic controls and other long-familiar kinds of electrical apparatus. But they know little, certainly not enough, about electronic devices. Hence they kept away from them as much as possible, simply because they did not know what to look for on inspection, or how to locate trouble.

A course of instruction, based on a written description of each control used and a full explanation of the method of operation, took away all the former mystery. Not all the men can be considered experts, but they can perform certain functions with confidence and skill.

Training courses for maintenance men are by no means new, but there is little doubt that they could be used more widely to good advantage. Electronic devices of one kind or another will find ever-increasing application in industry. Men competent to service these devices must be trained, or obtained from somewhere.

Not all tradesmen, electrical or otherwise, have been well trained, or are thoroughly familiar with the best methods and practice. A good, practical course of instruction would help many maintenance men to better their lot, with obvious advantages to their plants.

Static Electricity Never Ceases to Be a Hazard

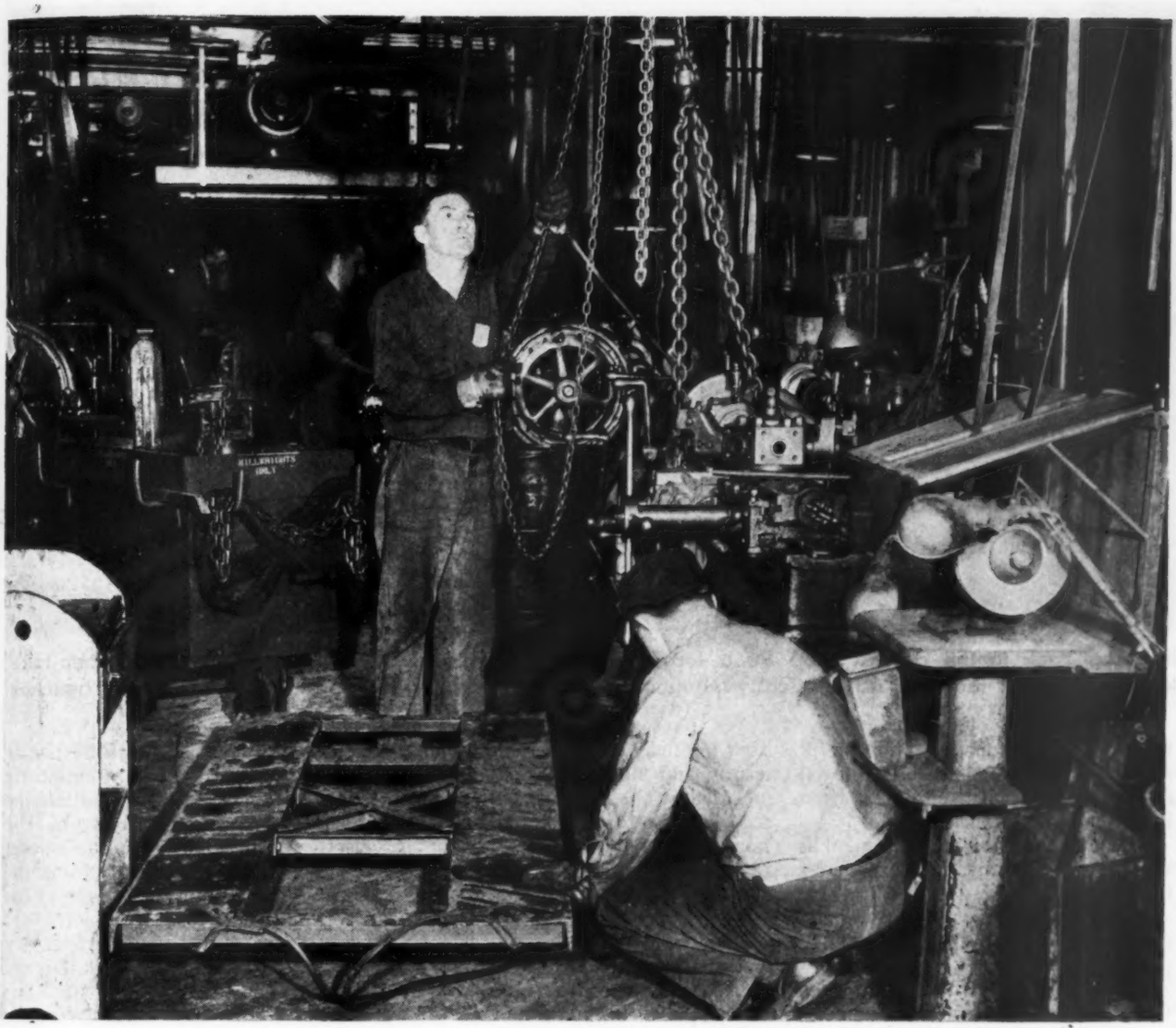
WATCH OUT for static electricity wherever flammable gases, dusts, or liquids are present. Failure to do so, or reliance upon ineffective methods to control the accumulation of static, results in losses to industry that run into millions of dollars a year.

Static electricity can be generated under a variety of conditions. In fact it is usually difficult or impossible to prevent its formation. A great deal can be done, however, to prevent static charges from building up to a dangerous magnitude. Effective precautions are particularly needed in the autumn and winter because the lower humidity that prevails in a large part of the country during these seasons tends to favor the building up of static charges. It is not always realized that under favorable conditions, potentials up to 60,000 or 100,000 volts can readily be generated by belts.

One of the first steps in reducing the hazards created by static charges is to find out where they exist. Two simple devices, a gold leaf electroscope or a neon tube detector, will answer that question.

Protective measures cover a considerable range. Grounding is effective, but it has its limitations. Furthermore, unless it is properly done, it may be useless, or even increase the hazards, while promoting a false sense of security.

After the most suitable measures have been worked out and applied, there still remains the necessity for making sure that they are properly maintained, that operators consistently observe whatever precautions are necessary, and that new, unprotected hazards are not set up by changes in equipment, methods, or materials.



At Maxwell, Manning & Moore, machines are pulled off the busy productive floors, and new ones are installed, with a minimum of interruption to production. Forethought and planning are the answer

Planning Machine Moves

H. M. BRADLEY, **Plant Engineer, Manning, Maxwell & Moore, Inc., Bridgeport, Conn.**

To MOVE MACHINERY in multi-story buildings, each with a floor area of 10,000 square feet, covering in all approximately 200,000 square feet, without disrupting production, and doing it safely, calls for well thought-out planning.

At the Bridgeport works of Manning, Maxwell & Moore, Inc., every square foot of floor space is utilized for production except one 6-ft. main aisle which allows traffic to pass through the center of departments. Therefore, it requires a lot of forethought and planning to pull a machine out for repairs or changes, or to install a new piece of equipment, from an area which does not allow much elbowroom, without seriously disrupting production.

On every floor in the plant there is a conspicuous sign showing permissible floor loads per square foot of area, and a complete log book is kept of every square foot right down to the smallest space. Although it took some time to compile, this book has proved worth while because no costly overloading is done. In drawing up rearrangement plans of any kind the log book is referred to constantly.

The planning part of moving consists of close cooperation between the plant superintendent and his foremen and the maintenance department. It sometimes takes weeks of scheduling their work so that at a given time, usually when a run of production work permits and near the end of a shift,

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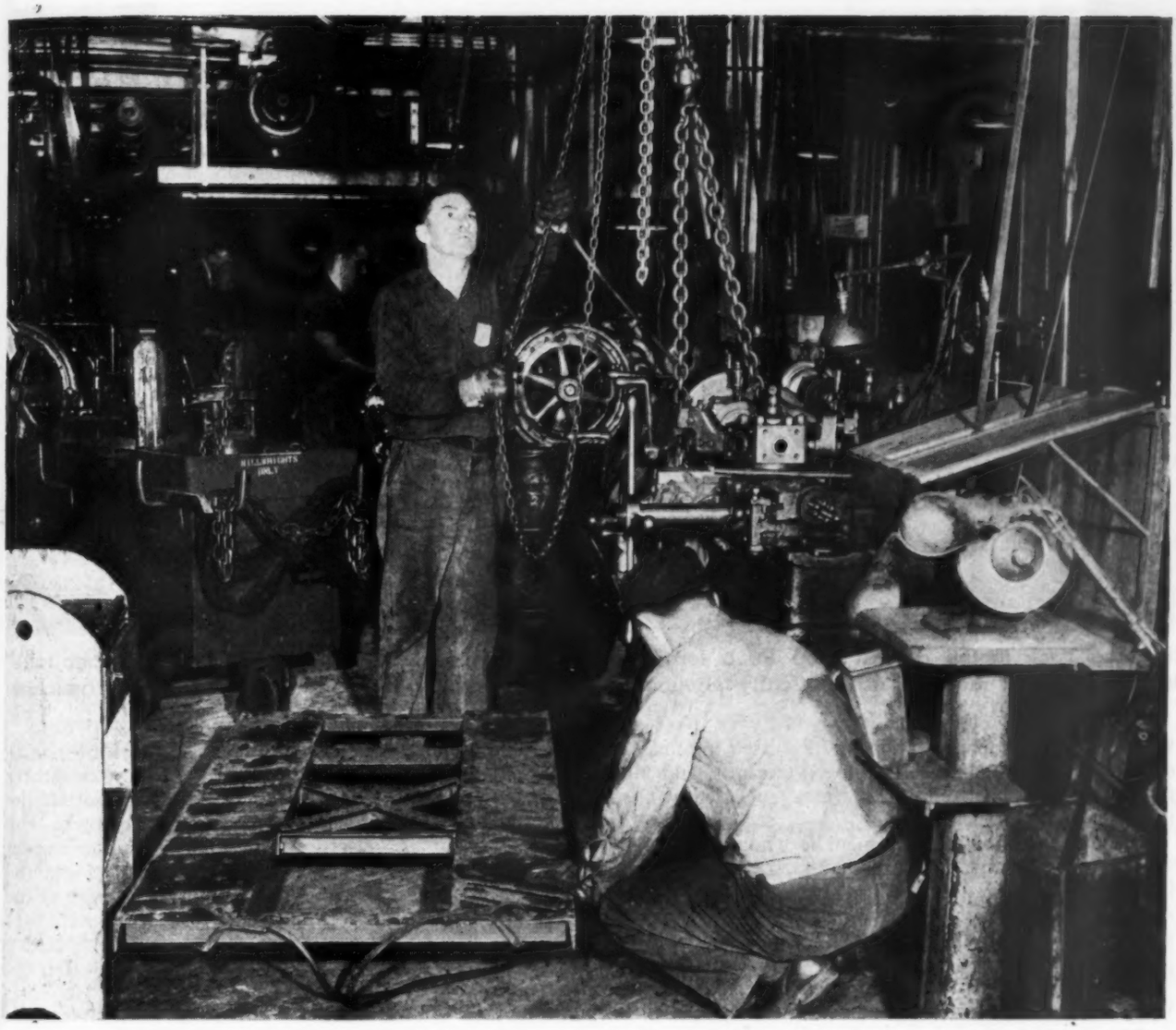

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The planning part of moving consists of close cooperation between the plant superintendent and his foremen and the maintenance department. It sometimes takes weeks of scheduling their work so that at a given time, usually when a run of production work permits and near the end of a shift,

Running back to the central shop for a forgotten tool or piece of material is practically eliminated by the use of portable workbenches. Workmen take pride in adding new and useful gadgets to benches

the move can be made. This careful scheduling usually eliminates the need for overtime, which is important from the maintenance expense angle.

The contemplated rearrangement is started by the plant superintendent's issuing a works order for the job. He states the purpose of the move and gives a definite time for the work to be performed.

This order is properly recorded when it is received in the maintenance department, and a schedule is made and turned over to the maintenance division supervisors who will perform the labor.

Planning Schedules

For example, if three divisions, such as electricians for motors and wiring, steamfitters for air, water, steam, or oil pump service, and millwrights for the general move and installation, are involved, the respective heads of these divisions, who meet daily with the plant engineer to plan schedules, are given copies of the order, and the estimated cost of labor and material to do the job at the time specified is recorded on their hourly work sheets.

All preliminary work is done before the actual move, such as bringing the necessary services to the area so that only the necessary connections will have to be made, even though the present equipment is still continuing to operate.

If a new piece of equipment is being purchased, all items—the machine itself, motors, wiring, switches, piping, guards, and all installation parts—are included at one time on the purchase requisition so that streamlined installation will result when equipment is received.

No Waiting Around

When the designated time to do the work arrives, the mechanics involved are prepared to perform their individual functions separately or in sequence as the job requires. The main idea is to prevent having a group of mechanics standing around waiting for another group to complete its part of the job. Timing is necessary to obtain best results.

Each maintenance division, before proceeding to the place where work is to be done, makes sure that all the necessary tools and materials are carried on the traveling workbenches which accompany each working group. Every provision has been made to make these small portable units as complete as possible. Mechanics and supervisors are continually originating new gadgets for these trucks to facilitate the work. They realize that trips back to the central shop take time and, since the estimated time and cost are on the works order for all to see, it is a matter of pride to try and beat these figures.

The maintenance office is notified by telephone that production on the equipment to be moved will stop at a certain time.

The electrical supervisor, who has already scheduled his work to include this job, is called on the loudspeaker by the maintenance office, and told the exact time he can get to work. The electrical supervisor in turn announces by loudspeaker, to the next maintenance supervisor involved, that all the electrical work will be completed at a certain time, so that the next operation can start without delay. Say it is the millwright supervisor. He, too, has scheduled his daily work to include this job.

Plant Is Protected

To protect the factory while work of this nature is being performed, in case of breakdown elsewhere, mechanics who have definite assignments in each division are available. For instance, several millwrights are assigned machine areas, covering approximately 20,000 square feet to a mechanic, to do all belting, oiling, greasing, and servicing of any nature necessary to those departments. These men, if required, can be called by the loudspeaker system to take care of any emergency breakdown in the absence of the general millwright force.

The new piece of equipment is brought from storage to a position in the department where it can readily be handled into its new location. The equipment to be removed is then raised from its position and swung by chain falls onto a special dolly for transportation to its destination. This dolly is constructed of 10-in. channel

WORKS ORDER TO DEPT. NO. 140 W.O. No. 139925

Date Issued	WHEN COMPLETED DELIVER TO DEPT.	Date Required
2-5-45	141	6-2-45

Order No. or Charge Acct.	Quantity	Description	Part No.
103-4252	1	No. 2 Universal Machine	

The following special work is required by Dept. No. 141 O. Brazis Foreman
(To be signed by Foreman of Dept. requiring work done)

Pattern No.

Purchase and install one (1) No. 2 Universal Machine in Dept. 141. This is to replace the present worn out Miller. The present milling machine is to be stored in machinery storage for further distribution. Installation to be made by the Maintenance Department as estimated by Mr. Bradley, Plant Engineer, on June 1, 1945.

Drawing No.

Equipment No. 2994

Req. Nos.

Check One—Straight Repair | | Affects Rate | |

Completed Date	Estimated Mat'l Cost	Estimated Labor Cost	Authorized by
	$4235.00	$35.00	K. E. Miller

Received by Date	Actual Mat'l Cost	Actual Labor Cost	Overhead Cost	Total Cost

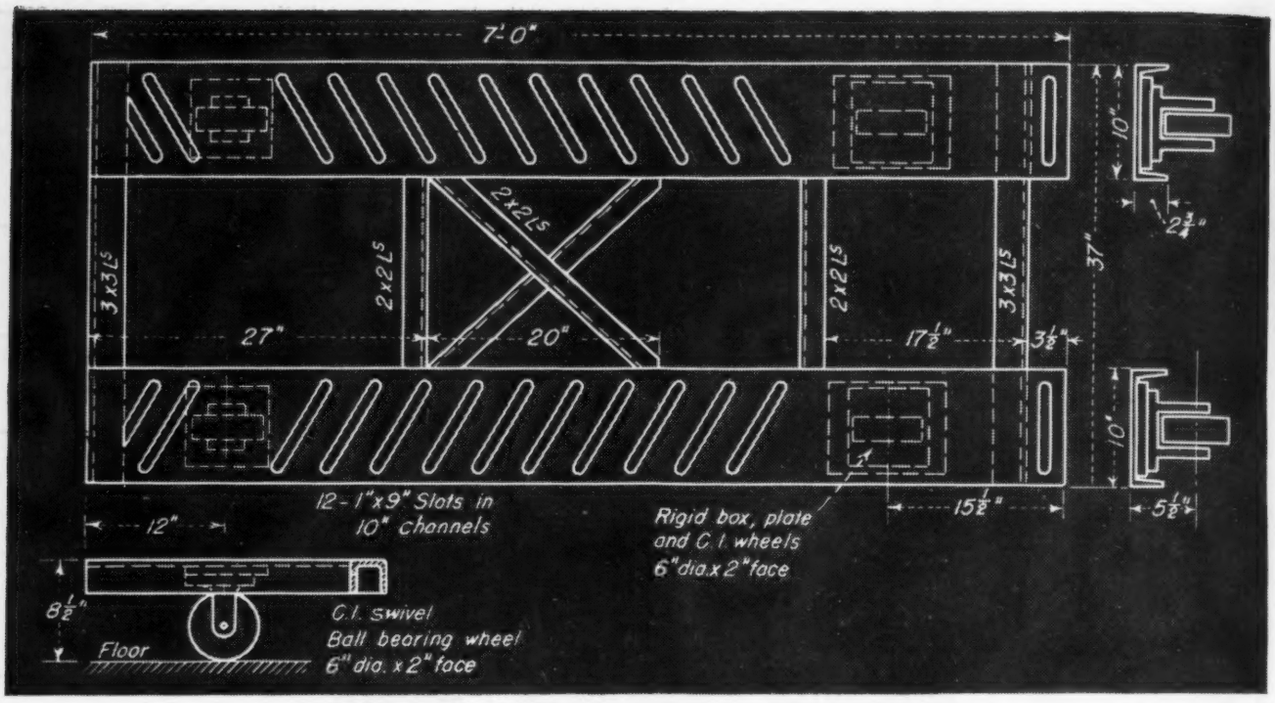
Everything starts with a works order issued by the plant superintendent. When the order has been recorded, a schedule is turned over to the maintenance division superintendents who will do the work

MAINTENANCE WORK HOURS

WEEK STARTING 1-29-45 MEN AVAILABLE 7

W.O.	CHARGE ACCOUNT	DATE REC'D.	EST. HRS.	DESCRIPTION OF JOB	YOUR PROMISE DATE
106846	160-402 3613	1-25-45	400	Rewire Bldg. No. 5.	3-31-45
102427	106-4227	4-21-44	40	Install Automatic Card Recorder	3-31-45
150264	167-406 4345	12-1-44	39	Move telephone box	2-15-45
68919	103-4171	8-10-44	50	Install Wheelco controls	2-15-45
145863	189-403	1-17-45	200	Make repairs to Generator	3-31-45
154495	102-4331	10-24-44	81	Wire Bldg. No 5 Dept 166	3-31-45
150250	102-402 4344	10-30-44	70	Install Fluorescent lights	2-15-45
154010	103-4099	12-7-44	25	Install temporary control Equipment	2-15-45
110608	103-4251	1-5-45	20	Install Pantograph Mach.	2-15-45
89793	103-4304	12-7-44	20	Install Globe tapper	3-31-45
89792	103-4303	12-7-44	20	"	3-31-45
146741	120-403	12-18-44	35	Install wheelco	4-1-45
150245	176-403	12-18-44	50	Rewind 10 Hp Motor	4-1-45
146189	171-403	11-7-44	30	Rewind ¾ Hp motor	4-1-45

All maintenance work is scheduled in advance, so there is no difficulty in fitting in a machine move when one is contemplated. The estimated number of hours required for each job is noted, and the date



Details of dolly used to convey heavy machines. Bolts are dropped through the bed of the machine into slots, to prevent the possibility of the machine's shifting during transportation

iron with slots on the flat side of the channel line, so that the machine can lay perfectly flat, with bolts dropped through the bed of the machine into the slots to prevent the machine from shifting during transportation. The wheels on the dolly are of the ball bearing type and sturdily constructed so that the heaviest machines can be moved easily at a low center of gravity. This method eliminates the necessity for, and the dangers of, skidding or blocking up the machine.

Dollies Most Convenient

Since the aisles throughout the plant are narrow, and the elevator area also is limited, machines can be handled on small dollies in and out of areas more conveniently than by any other method.

The class of production work done above the first floor areas does not require equipment weighing more than 4000 pounds, so that no difficulty has been experienced in handling equipment up and down on freight elevators rated at 4000-lb. capacity. To be sure that these elevators are in order at all times, they are visually inspected and serviced by a plant electrician once a week, by an outside elevator company once a month, and by insurance and state inspectors periodically.

New equipment is placed into position in the same manner in which the old was removed. It is lined up and leveled by millwrights, who service the machine before leaving it. The last operation is to fix a brass tag, with the equipment number on it, in a conspicuous place so that accounting and maintenance records can always refer to equipment by number.

If the millwright's work is not extensive, an electrician and a helper assist the millwrights (two mechanics and the supervisor), to place the unit in position. Then while the millwrights are lining up, leveling, oiling, and greasing the machine, the electricians complete their work, connecting motors, switches, and wiring.

The last supervisor notifies the production foreman of the department that the equipment is ready to operate, and the department foreman okays the works order form.

The old equipment, removed by the millwrights from the department, goes to the machine repair division for repairs, or to storage to be sold or held for some future placement.

The mechanics who were involved in the work now return to their previous jobs. The supervisors turn in the works orders, with time attached, to the maintenance office. Labor and material necessary to do the work are noted on back of works order form, so that the cost analysis can be checked against the estimate.

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Standardized Factory Facilities

ROBERT MacLATCHIE
Industrial Engineer
RCA Victor Division of Radio Corporation of America, Camden, N.J.

LONG BEFORE THE WAR it had become evident that a vast number of plant layout and rearrangement problems at RCA could best be solved through standardization of factory facilities. A vigorous program was therefore started early in 1940. It was accelerated by the war with its special need for large-scale conversion from peacetime to wartime production. Today there are in use more than 24,000 pieces of factory facilities representing approximately 30 standardized designs. New installations as well as rearrangements of existing facilities are now made in perhaps half the time that would formerly have been required, and facilities rearrangement costs per square foot have dropped sharply.

As a result of previous efforts in standardizing workplace equipment and machine equipment, we had already learned that it is possible to develop a rather complete complement of equipment, fixed as to details of construction, yet of vast adaptability to the widely varying situations encountered in industry. Experience had proved that the "complete complement of equipment" need not be of infinite variety, but that a few standardized types would adequately serve our neds.

This basic concept encouraged us in our newly undertaken program of standardizing factory facilities. We had learned that it was easier and more economical to manipulate a relatively small but standardized selection of equipment, each with its constructional details frozen. That this concept was proved correct, has been borne out in the use which RCA has made of standardized facilities. For example, in one plant alone there are in use today more than 1000 standard totebox dollies, 5000 lineal feet of standardized office partitions, 3000 standard stock racks, 1500 standard benches, 3000 standard chairs, and so on through a list of perhaps 30 items.

The advantages to be gained through such standardization are many. They include the following:

1. The layout engineer's problem is simplified through a reduction in the number of *different* elements he must handle in order to design a floor layout.

2. The numerous advantages of mass production may be applied to construction of factory facilities when they have been standardized.

3. If a standard design is available which is adaptable to the problem at hand, no time is lost in designing a new facility to fit the need.

4. If standardized facilities are available from a previous installation, time and expense of constructing new facilities may be largely saved.

These benefits are applicable not

Factory Facilities Standardized at RCA

- Totebox dolly
- Pipe and chain railing
- Office partition
- Expanded metal partition
- Warehouse rack
- Factory writing stand
- Rack for wire reels
- Service dolly
- Instrument storage dolly
- Underbench rack
- Cloakroom rack (3 and 6 feet long)
- Stock rack (3 and 6 feet long)
- Tool crib rack
- Bench (3, 6, and 12 feet long by 18 inches wide)
- Bench (3, 6, and 12 feet long by 24 inches wide)
- Utility cabinet
- Laboratory workbench
- Janitor's truck
- Box locker
- Rest area bench
- Chair

FACTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 90 • November, 1945
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Except for a few types of materials handling equipment, facilities are non-standard. The area is a pre-war radio assembly department which was removed to make way for the war production installation shown on the opposite page. Bench is "built-in" and had to be completely torn down in order to be relocated or removed. Many stock racks and other items visible in the background are so high as to obstruct a sweeping view of the floor. While the transport equipment used here would be excellent in metal fabricating shops and for many other purposes, it was not compatible with the activities in this department. Smaller, completely mobile equipment should have been used

only to standardized factory facilities but also to other standardized equipment such as machinery and office furniture.

At the beginning of the standardization program at RCA we were not fully aware of the desirability of following particular rules or principles or of bearing in mind certain basic considerations. However, as time went on we observed that definite relationships exist between different types of facilities and that a neglect of certain considerations invariably would lead us into difficulties. For example, we developed a stock rack that was quite utilitarian but was awkward and clumsy in appearance. It was so out of keeping with its surroundings that people seemed naturally to shun its use. This taught us that appearance was an important factor in the success of an article, even though its utility was not affected.

Basic Design Principles

From these experiences we became convinced of the need to follow some set procedure during the course of design which would assure our taking into account such architectural considerations as utility, appearance, accessibility, and interchangeability, as well as such engineering considerations as durability, ease of construction, and use of common materials for construction. Consequently, a list of design principles and considerations was established. Over a period of time these principles have been condensed and simplified so that our list now contains just five basic rules.

1. Each facility should be of unit-style design.

2. Each facility should be so designed as to have the widest practical application.

3. Each facility should be so designed as to afford maximum operator comfort and efficiency.

4. Each facility should be of rugged and durable construction, and it should be compatible with its surroundings.

5. Each facility should be designed for maximum simplicity of construction, of maintenance, and of housekeeping.

There is no implication here the designer need necessarily be either architect or engineer in order to design successful standard facilities. But it is essential to recognize the responsibilities with which the designer is to be entrusted. This much is definite: A company that makes capital investments in factory equipment wants the best possible equipment and expects that equipment to have a long, long life. The use of standardized factory facilities is a big step in this direction *if the designs have been carefully worked out and tested.*

It is also well worth observing that the success of a program in any plant will be better assured if factory supervisors are kept informed of progress. Early in the RCA program we prepared a pamphlet describing the standardized facilities then available, and have added information to this pamphlet from time to time. Supervisors who were thus informed broadened the application for many of the items illustrated, and a number of the pamphlets found their way to other plants where similar programs have since been adopted. The items designed for use at RCA are not necessarily useful in all other industries, but in any event efforts toward standardization of facilities should be based upon the application of principles such as those listed.

Design Principle No. 1

Each facility should be of unit-style design. Almost all standardized devices in the world have in common this one

The same area after old facilities had been removed and standardized equipment installed. Note marked improvement in appearance. This photograph, taken three years ago, illustrates the progress in standardization of factory facilities that had been made at RCA even at that early stage of the program

foremost feature. It is evident that the greatest advantage accrues when a given facility has to be designed but once, as a standard *unit* item. This makes possible the elimination of frequent redesigning of each type of basic facility and the attendant repetitive cost estimating, breakdown of bills of material, ordering, construction planning, and so on. The reader's attention is called to the standard facilities used in railroad construction. It is readily seen that the ties, rails, hardware, car tracks, couplings, are each of unit design, and that their use has been economically beneficial.

At this point the question logically comes up, "How does the designer establish the unit design?" Two factors are the primary guideposts:

1. Utility of everyday use.
2. Ease of handling for relocation.

First, utility of everyday use. Certain desirable dimensions or sizes frequently exist, as in benches where the space required by one operator can serve to establish the over-all size. Here the design ultimately provides for one or more of the basic one-operator spaces. The size of work and nature of operations at RCA are such that a bench width of 18 inches is usually satisfactory when operators occupy only one side of the bench. Where operations are carried out along both sides of the bench space, two 18-in.-wide benches are placed back to back.

The length of the bench is determined by the left-to-right space required for one operator, and 12-ft. benches are commonly used to provide space for four operators occupying 3 feet each. For maximum flexibility of layouts and for cases where fewer operators are required, even subdivisions of the 12-ft. length, specifically 6 feet and 3 feet, are used.

Facilities that are required with casters and intended to be pushed about from place to place in the transportation of material containers are dimensioned for maximum convenience of the stock handler and also to suit the dimensions of standardized containers. Widths of aisles and dimensions of storage or "parking" areas are likewise correlated.

The second consideration is ease of handling for relocation. One should never "build a boat in the cellar." Maximum size of unit-style facilities must be within limits determined by doorway openings, elevator dimensions and weight capacity, floor loading capacity, aisle and hallway widths, and so on. Elevator sizes, especially, can be deceptive; it would be well to measure all the elevators in the plant before beginning a facilities standardization program.

As already noted, the standard benches used at RCA are 3 feet, 6 feet, or 12 feet in length, but at first we had some doubts that the 12-ft. length would be manageable in some of our elevators. This did prove to be the maximum practical length that we could handle, and in a few instances it has been necessary to open the cage roof of the elevator and stand the 12-ft. benches on end to transport them from floor to floor.

Since we are so careful to limit maximum sizes for ease of relocation, it is only logical to design facilities for comparable ease of connecting and disconnecting, both mechanically and electrically. Benches, racks, machine supports, and similar items at RCA are fastened to the floor with a few lag screws at carefully chosen locations. A 10-in. pocket wrench is all that is needed to loosen these facilities from the floor. Benches and similar items are joined together end to end or back to back with several $\frac{3}{8}$-in. machine bolts.

Electrical connections are always made through plug-type connectors. Compressed air is used extensively in the plant, and standard benches are equipped with a pipe containing one plug-in outlet for each operating position, and this pipe is connected to the source of compressed air with a flexible jumper hose. The hose likewise is provided with quick-action fittings. Many rearrangements are now made that involve disconnection and reconnection of electrical and other services, without benefit of a skilled craftsman to dismantle the existing services and to re-install them in the new locations,

Capacitor manufacturing department. Benches, underbench stock racks, totebox dolly, toteboxes, service dolly, and utility cabinet are all standardized units—all designed to afford maximum ease of relocation. A department similar to the one shown here, but covering a floor area of 20,000 square feet, was rearranged over the weekend with an expenditure of only 150 man-hours. Underbench rack is designed to provide a storage area immediately adjacent to working positions. Totebox dolly is used to transport materials between operations and as a source of supply or place of disposal for materials at individual operating positions. Service dolly is used to move parts from and to stockrooms. Utility cabinet stores small expensive tools, fixtures, and supplies adjacent to the work area

simply because the services are, in most instances, self-contained or of the plug-in type.

In one recent rearrangement, made over a weekend without interruption to production, all the facilities in an area of 20,000 square feet were rearranged. These facilities consisted of 60 standard benches, 96 stock racks, 8 factory writing stands, 24 light machines, 60 underbench racks, 120 lineal feet of expanded metal partition, and numerous smaller facilities. This work required no more than 150 man-hours of comparatively low-cost labor, and was accomplished without delay or incident. *All the facilities moved were of individual unit-style design.* If facilities of former design had been used, it would have been necessary to shut down production in the area for several weeks while old facilities were torn out and new ones constructed and installed. Labor costs would have been incomparably higher, and much new material for fabrication of benches, stock racks, and other facilities would have been consumed.

Of course, the need for relocation is greater in some types of industries than it is in others. Generally speaking, plants doing assembly work require rearrangement from time to time to meet manufacturing conditions imposed through the introduction of new models and new types of products. Fabrication industries run a close second, whereas process industries such as textile and chemical manufacturing are relatively stable. At the same time, however, specialized facilities used in process industries frequently tend to be bulky, complicated, and expensive. Although these facilities might be rearranged only once or twice in the

Built-in stock racks formerly in use had to be completely dismantled and scrapped when stockrooms were relocated. New unit-style racks shown here can be removed without loss to new locations when necessary. Use of carriage bolts and angle-iron shelf supports makes the new racks self-supporting, whereas it was necessary to tie the old-style racks to the ceiling for support

course of many years of use. they should, whenever practical, be so designed that large expenditures for dismantling and reassembling are not required.

Design Principle No. 2

Each facility should be so designed as to have the widest practical application. "What to do" in this case is probably best illustrated in an example of what not to do. Let us assume that unit-style stock racks are to be designed for a plant making small mechanical assemblies so that materials may be stored conveniently. Here there may be a temptation to design racks of two or three sizes, different in two, or perhaps all three, of the major dimensions. This might be done so that several of the larger racks would be adequate for the storeroom or stock accumulation area, whereas a few of the smaller size racks would be adequate for use in various places on the production floor.

Obviously, if a plant layout is based on using the two sizes of stock racks as described, these racks will not necessarily be interchangeable at some later date when a further rearrangement is to be made. If, however, the same major dimensions are used for racks in all locations, they most certainly will be interchangeable.

This may appear, at first thought, to be poor economy because it may be correctly argued that in order to do this the smaller rather than the larger of the two sizes must be adopted as a standard, and hence many more units will be required to provide the same storage space in the stockroom. It is true that more units will be needed, but little additional material and labor, if any, will be required to build the larger number of stock rack units since each unit is comparably smaller. As a rule, the cost per unit decreases to some extent as the quantity to be made is increased, since all the parts of which a standard stock rack is made are themselves standard by very reason of the fact that the complete rack is standard.

Of considerable importance also is the fact that greater flexibility of use will be realized when the smaller easier-to-handle size is adopted as standard. In the stockroom example cited above, when three or four large racks are used, a change of one rack, plus or minus, means a change in storage capacity of perhaps 25 percent. With the smaller units the stockroom capacity can be altered a few percent either way at will, frequently without disturbing other elements of the layout. Thus all the stock racks can be interchangeable and it will make no difference whether their destination next month or next year is a stockroom, the production floor, or wherever stock racks are needed.

At RCA a standard stock rack is 6 feet long, 18 inches wide, and 42 inches high. Occasionally there is a need for stock racks about 34 inches in width but with the same length and height as the standard rack Here interchangeability plays a forceful role because we solve the problem by placing two 18-in. stock racks parallel, or back to back, as it is commonly expressed. For use in stockrooms the racks also may be placed in tiers, one on top of another, to the desired height, and end to end to form a section of racks of any length within the dictates of good layout practice.

This brings us to a consideration of "modular" design, which is to say that, within practical limitations, the various unit-style facilities should have the same or compatible major dimensions.

The experienced plant layout engineer will readily agree that desirable layouts often have a rhythmic or symmetrical appearance. This appearance usually obtains when a large portion of the facilities in a layout, although different in purpose or operation, have similar major dimensions.

Every reader will recognize in this the pleasing impression gained when one walks into a large office of any well-operated concern using modern furniture and office equipment. Even

though the desks serve men whose activities and functions widely differ, and girls who do clerical work or typing, all the desks can be virtually identical in outward appearance. They are perhaps all oak or all walnut; they are of the same length, width, and height; and typewriters frequently recede into one of the pedestals which has the appearance of a tier of drawers when the compartment door is closed. File cabinets are frequently of the same or compatible major dimensions so that their appearance is harmonious.

This *modular design* in modern offices is extended to the arrangement of lighting fixtures, size and spacing of windows, size and shape of floor patterns, and so on. This the reader may mentally contrast with pictures of the "1890" office. Lamps were hung in a few places where light was indispensable, but no attempt was made to provide uniformly distributed illumination; windows and flooring gave the impression of necessary evils. Each piece of furniture appeared sufficient unto itself. Desks were enormous, with roller tops; office machinery stood on an assortment of tubular frames; and the general effect was one of disorder and inefficiency.

Certainly there is an air of order and efficiency about the modern office achieved largely through its modular design. It is often possible to achieve this same effect in industrial plant layouts when facilities of modular design are used.

At RCA the basic module of length is 3 feet. In other words, stock racks, benches, partition sections, cloakroom racks, and so on, are designed to a length of 3 feet or even multiples thereof (i.e., 6 feet and 12 feet, but not exceeding 12 feet because of prescribed size limitations as discussed under design principle No. 1). Likewise 18 inches is the basic module of width. Again, benches, stock racks, toteboxes, totebox dollies, packing material racks, underbench racks, utility cabinets, die-storage racks, and so on, are designed to conform to this measure of width or even multiples thereof. Thus the application of modular design is simply the repetitive appearance of basic major dimensions.

It may be noted that a module of height was not mentioned. It is our belief that it is neither necessary nor desirable. Bench height of 36 inches was determined in order to permit operators to work in either a sitting or a standing position. Chair heights, of course, are established to suit the physiological make-up of the operators; and totebox dollies are of the proper height for greatest ease of use.

When factors such as these do not automatically establish a limit, it is desirable to restrict the height of facilities to permit a clear view of the area in which they are located. This receives little attention in many plants, although it is evident that the general appearance of a factory or office is greatly improved when people entering the area can have an unobstructed view of the entire floor. But most important is the psychological improvement in supervisory control of the activities of factory personnel. Since everything gives the appearance of being out in the open there need be no dark or obscure corners conducive to waste of time, and there is far less chance of poor housekeeping and accumilation of unwanted materials and scrap.

Die-storage racks of non-standard design have been replaced by unit-style rack (opposite page). The old racks varied in length from 15 to 25 feet. Some of them extended well above eye level. Flat tops provided space for accumulation of never-used odds and ends. Dies were less accessible than in open-frame racks now in use

Design Principle No. 3

Each facility should be designed to afford maximum operator comfort and efficiency. All too frequently the importance of this principle is overlooked in designing objects used every day.

No doubt, the reader has had numerous annoying experiences in sitting at a desk or table where the chair height was not suitable, or at a soda fountain when legroom was insufficient or a footrest was missing. In a factory these inconveniences may be very distracting to an operator who is expected to perform an exacting task or turn in a good day's performance. Perhaps these little annoyances, or the necessity to reach a few extra inches for materials, may add only a small percentage to the labor cost of the product, but this small percentage can become a considerable factor in the selling price.

There are numerous cases where this design principle has had further application in the development of standard facilities. For example:

1. Factory bench tops, including framing members, are limited to 3 inches in thickness to assure maximum operator legroom. Drawers beneath bench tops are avoided for the same reason, as well as to avoid accumulation of superfluous material.

Standardized unit-style die-storage rack. Steel plate covers plank shelving to present a smooth surface on which to slide dies. Construction is sturdy and in keeping with massive steel dies which rack must support. This rack is one of several that have been relocated twice in the past few years, yet it has shown no signs of weakening. Standardized die racks may be spotted about the steel stamping room so that minimum travel is possible between die-storage area and presses

2. Adjustable chairs or chairs of various heights are available for use where needed. Stools without backs are avoided.

3. Bench height is standardized at 36 inches to permit operation in either a sitting or a standing position.

4. Toeroom is provided at the base of standard facilities in positions where operators work.

5. Fiberboard is used as a bench topping material in preference to sheet metal wherever possible, because the latter is cold and uncomfortable to the touch.

6. A footrest is provided beneath all standard facilities at which the operators sit.

7. Coat racks and box lockers are included in the list of standard facilities. This not only provides facilities for the operator's personal belongings but also makes it possible to insist that bench tops and machines shall not be cluttered with personal effects.

8. Handles, knobs, and so forth, are carefully located for maximum convenience. On small carts or push trucks this is also important from the standpoint of safety, because a handle that is too low may cause the person pushing the truck to be looking toward the floor rather than ahead.

Numerous other items of this nature are included in RCA designs. The foregoing were selected as representative of problems encountered in most factories.

Design Principle No. 4

Each facility should be of rugged and durable construction and it should be compatible with its surroundings. Here it should be borne in mind that one of the principal reasons for standardizing facilities is so that they will have multiple applications and hence will not be readily outmoded. It is expected from the beginning that they will have a long life, and they should be designed accordingly.

We had considerable difficulty in this regard with the casters and wheels on movable facilities such as totebox dollies and janitor's dirt trucks. Casters are frequently the weakest part in the design of such equipment. This is not usually the fault of the caster but simply because casters of the wrong type are specified. In case of doubt it is better to specify the heavier of two casters under consideration.

Although it may at first appear drastic, one of our standard tests for small portable facilities is to push the dolly or similar facility off a stair landing so that it tumbles down a flight of concrete steps. If the caster is not bent or damaged, it may be assumed that it will withstand, for a satisfactory period of time, the normal handling encountered in factory operations. Amusing as it may seem, this is not an impractical test because the grade of labor normally employed in stock handling has little regard for the value and care of stock handling equipment.

Racks for the storage of dies are often a problem. At one time it was customary at RCA to build racks for

the storage of heavy stamping and molding dies so that the racks were bolted to, or partially supported by, building walls or partitions. They varied in length according to the total need for storage space, and racks more than 40 feet long were not uncommon.

Die storage racks were seldom relocated during the course of a plant rearrangement even if their length permitted, since to move the racks away from the supporting wall was to invite their collapse. Used racks were usually scrapped and replaced with new ones. The standardized unit-style die rack now in use is 12 feet long and is completely self-supporting, being of much sturdier construction than the old type. It may be relocated many times without fear of damage or weakening as evidenced by the fact that several already have been relocated twice during the first few years of their lives.

If we take the time and trouble to design facilities which are durable and which otherwise serve their purpose well, we should not fail to make sure that their appearance is compatible with the surroundings.

The rule says "compatible"; thus it would be as impractical in many plants to furnish new oak desks to factory clerical help as it would be to furnish shop benches to office personnel. As a rule, it is best to use a good grade of paint or lumber in preference to a cheap grade, a hard-finish wallboard in preference to soft, and other comparable materials and finishes. In the long run, cheap paint costs less only at the time of purchase. It is soon faded, scuffed, or dirtied; and the shop using it takes on a shabby appearance. Inferior grades of lumber tend to check, split, or fracture; and facilities so made give the shop a broken-down appearance. Manufacturers of nationally advertised brands of paint have devoted considerable time to the development of pleasing and compatible color schemes for factory equipment and interiors, and it might be well to take advantage of the service they offer.

Of course, there are instances where durability is of no advantage and actually may be uneconomical. Although there are no facilities in this category in use at RCA at the present time, it is possible that pallets used with fork lift equipment or containers for greasy parts in process need not be durable since their useful life may be short.

Design Principle No. 5

Each facility should be designed for maximum simplicity of construction, of maintenance, and of housekeeping. In the course of designing standard benches we experimented with the use of hardwood maple flooring, suitably assembled, for bench tops. For simplicity of maintenance this was discarded in favor of a rough plank top finished with a sheet of pressed fiberboard. It is undesirable, but frequently necessary, to cut holes and notches in bench tops and to put screws or bolts through them for mounting equipment. When a relatively permanent type of top is used, there is a tendency to relocate the bench during the course of plant rearrangements without replacing the top. When an inexpensive covering such as fiberboard is used it is a simple matter to rip off this top surface and replace it with a new sheet. This is done at RCA as normal procedure during the course of rearrangements and at such other times as the bench top is inadvertently marred through the use, say, of soldering irons and jagged materials.

For simplicity of construction many of our designs employ angle iron and strap iron for framing members. This permits the use of templets and jigs, burring and welding, and other well-known devices during the course of fabrication. Certain other materials are avoided because of their need for machining and drilling or, in some cases, because of their greater mass. Metal, lumber, fiberboard, and other materials are used in accordance with their suitability to the requirements of each case.

Keeping the height of facilities below eye level has already been discussed as a means of helping to prevent the accumulation of trash. However, there are other ways in which the proper design of factory facilities can aid in better housekeeping and cleaning. For instance, a stock rack designed with doors tends to be a catch-all; it is therefore desirable to design racks that are open on both sides so that there will be no dark corners. At RCA a utility cabinet with wire mesh doors for easy visibility is used for the storage of small expensive tools in exposed areas.

Personal effects are ruled out of the working areas, and individual box lockers are provided for their safe keeping. Other than these two items all standard facilities are designed to keep all materials out in the open.

The designer likewise should consider ease of cleaning. The more ornate or complicated a piece of equipment, the more likely it is to collect dust and dirt. One of the most prevalent and least simplified items in the average industrial plant is the office partition. During all the years of RCA's existence up to the past few years, office partitions contained 23 different pieces of material, excluding hardware, between floor level and the top plate of the partition. Their appearance was old-fashioned and ornate, and the many ledges seemed to invite the collection of dust. The new standardized sectional partitions contain by comparison only eleven pieces of material between floor and top plate, resulting in a far more neat and businesslike appearance.

Naturally, supervision should be depended upon to prevent evidences of poor housekeeping, but facilities should be designed to make the supervisor's problem as easy as possible.

Procurement

A list of some of the more commonly used articles on which standardization has been performed at RCA appears on page 139. Although many of these facilities were designed completely and entirely by RCA and made in our own maintenance and construction shop, quite a few are bought or can be bought from industrial equipment manufacturers. When such items are available on the market it may save time, trouble, and expense to purchase them ready made. There is no rule that defines which items should be bought and which items should be made by the user, except that the designer will find that certain items to suit his particular needs may not be available for purchase. Each designer of industrial facilities will have to satisfy himself as to the needs of his own plant. As time goes on, industrial equipment manufacturers will, no doubt, find a larger and larger market for their standardized products, and the user's procurement problem will be correspondingly simplified.

Lest the reader gain the impression that a program of the type described is of too vast proportions, he need simply note that a single sweeping plant conversion is not mandatory. The first significant change required is the adoption of a new policy: *When it is necessary in the course of plant rearrangements to replace existing facilities or to add new ones, it should be resolved that each new facility shall be of standardized design.* Second, it is necessary that capable personnel be selected for the responsibility of preparing and testing the designs, since the new facilities will represent a capital investment and must be suitable for many years of useful life.

Actually, from the time standardized facilities begin to appear, plant rearrangements will be easier to plan and easier to execute; and in the course of a few years a great improvement in the appearance and efficiency of factory operation should be evident.

How to Install and Maintain Electronic Controls (Part I)

H. L. PALMER, Industrial Control Engineering Division, General Electric Co., Schenectady

INSTALLATION, SERVICING, AND MAINTENANCE of industrial electronic equipment are not appreciably more difficult than with conventional industrial control apparatus. To service and maintain any equipment requires a reasonable understanding of the functions the equipment performs. Since electronic equipment is used to perform more intricate and exacting functions than other controls, servicing and maintenance usually require a more fundamental knowledge of the requirements of the equipment. When this very necessary understanding is acquired, adopt the same logical approach used with less complex controls.

After the fundamentals of the application are understood, it is essential to obtain all the information about the control equipment that is supplied by the manufacturer. This information ought to be studied before installing the equipment or attempting any repairs. It usually consists of an instruction book and diagrams showing the connections.

Diagram Subdivisions

Wiring diagrams have four major subdivisions: The elementary, the main diagram, interconnections, and material list. The elementary diagram is arranged to show the parts as they are used in the circuit. Certain devices, such as contactors, relays, and transformers, are split up, with their respective parts arranged so as to make the connections to them as simple as possible. That is, the contacts of a relay are shown close to the device or devices they control, while the coil of the relay is shown close to the contacts or tubes that supply it with power. Windings of the transformers are usually separated, with the primaries shown across the power supply along with other power equipment, while the secondaries appear next to their associated devices, such as filaments or grid circuits.

Parts of a single device are labeled with the nomenclature associated with that particular device. Transformer windings are usually labeled Primary or Secondary, to assist in following the diagram. Sometimes the parts of relays are tied together with dotted lines, to indicate which contacts operate simultaneously and which coil causes them to operate.

The elementary diagram is the first one drawn when a panel is designed. Because of the vital information shown in an elementary diagram and the clarity with which it is expressed, anyone who must become acquainted with or service any control equipment should learn to use it proficiently.

The main wiring diagram is prepared primarily for the man who wires the panel, since it is drawn with the various devices shown in positions that coincide approximately with their relative positions on the panel. The windings of a transformer are grouped in a common symbol, the same as the contacts

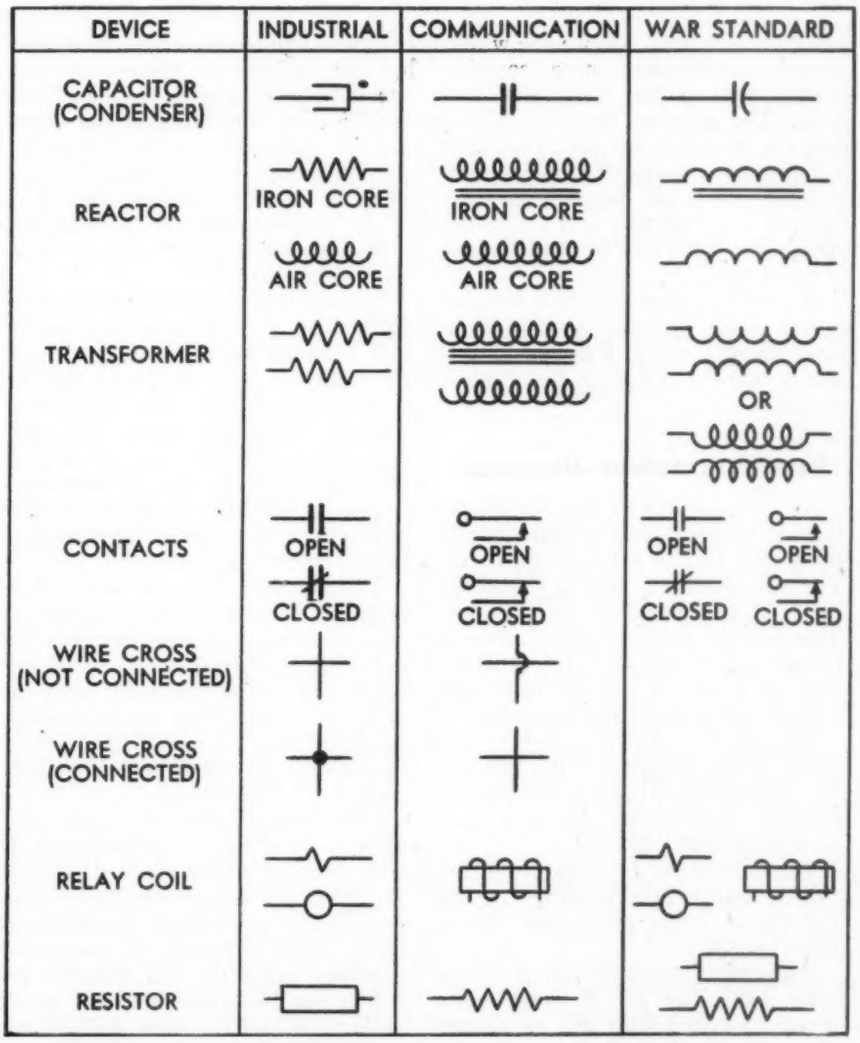


Figure 1. The last column shows symbols for various elements of electronic equipment adopted recently. In the two center columns are shown the symbols that were previously used

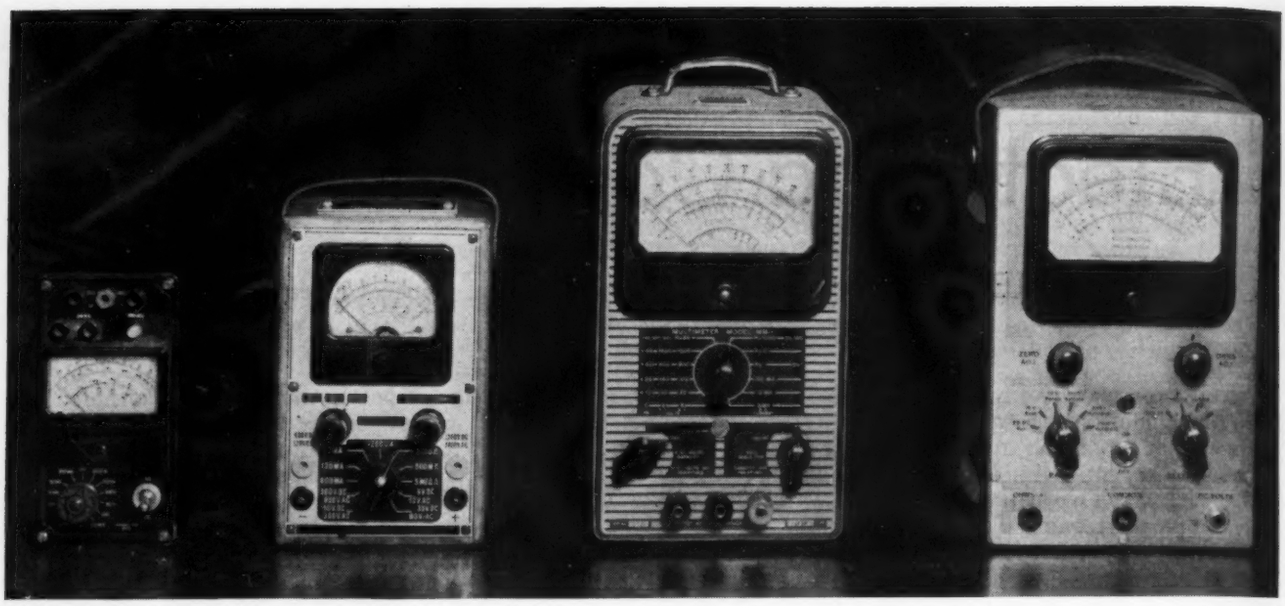


Figure 2. These instruments simplify checking and troubleshooting. The first three measure a.c. and d.c. voltages, milliamperes, and ohms. The instrument at the right indicates voltages and ohms

and coils of a relay. Hence the wiring appears considerably more complex than shown on the elementary diagram. The wires on the main wiring diagram, however, are exactly as they will appear on the panel. After a panel is built, the main function of this diagram is to identify and locate apparatus on the panel for replacement or servicing.

It is next to impossible to determine how a panel operates by studying a main wiring diagram, if the panel consists of more than three or four control devices.

Interconnection Diagram

An interconnection diagram shows the control panel with terminal boards connected to the external apparatus. The pilot devices as well as the equipment to be controlled are included. This diagram may include a number of control panels and several control devices, or it can be a single panel with a single set of associated apparatus.

The fourth and very important part of the wiring diagrams is the material list. Sometimes this list is 100 percent complete and can be used as a spare or replacement parts list.

Information as to voltages of the various transformer windings or the inductance values of reactors also is often included.

Tube types usually are given on this same list. The list is most useful when associated with the elementary diagram; therefore, it is usually included on the same drawing.

The electrician who wires the panel will have to use the wiring diagram, but the engineer or service man who has the problem of figuring out the operation or servicing of this panel will use the elementary diagram and material list exclusively. He will have to refer, however, to the main diagram when he decides to check some particular element, because this diagram is the only guide he has as to its location on the panel.

Standardized symbols for the control industry in general have been pretty well accepted for many years. There are a few optional standards—that is, a few devices have two recognized symbols. Originally, radio and communications engineers did not employ all of the symbols used by industrial engineers, but little confusion existed because the two groups rarely referred to each other's diagrams.

The first real confusion arose when engineers trained in the communications field began using tubes to solve industrial problems and supplying equipment closely associated with industrial control. Then the same engineers had to work with both types of equipment, and two sets of symbols could not be tolerated.

After considerable discussion, conflicts in six of the oustanding symbols were removed and the revised symbols are gradually being introduced into drawings of equipment manufactured today. Since a considerable number of drawings using the old symbols are still in use, however, both the previously used and the new symbols are shown in Figure 1.

In addition to the wiring diagram, an instruction book should be furnished by the manufacturer. Instruction books that cover the apparatus in great detail are expensive; therefore, complete books usually will be provided only with well-standardized, high-production panels, or expensive and complicated custom-built panels involving considerable engineering.

Regardless of the completeness of the instruction book provided with the panel, the individual responsible for the installation and maintenance of the equipment ought to study the book thoroughly before attempting to work with the control. Otherwise, serious and costly damage may result from attempting to operate the equipment before its functions are understood.

Study Instructions

Instructions for installation must be carefully read before unpacking or inspecting the equipment. Occasionally this equipment is delivered in advance of the time it is to be installed. In such instances the control should be left in its shipping container, stored in a dry place, and subjected to only moderate temperature changes. There have been instances in which control panels were ruined even before they were unpacked, because they were subjected to the high humidity present in new buildings where the concrete and plaster had not dried out.

When the equipment is to be installed, unpack it carefully, save all instructions, such as diagrams and instruction books, and give them to the individual responsible for the installation. Frequently this information is taken by some one interested in the operation or maintenance of the equip-

ment, leaving the person responsible for its installation without adequate instructions. If no instructions are included, notify the manufacturer immediately. Do not apply power until the instructions have been received and studied.

After the equipment has been installed and wired in accordance with the interconnection diagram, the external wiring must be checked very carefully, preferably by another electrician, because errors in these connections may destroy some parts of the panel or associated equipment and prevent its being operated for a considerable time. Do not eliminate these extra checks in an effort to save time.

Some competent person must make sure that fuses of the correct size have been put in all entrance switches, or in all load circuits that are external to the panel. All the notes on the wiring diagram relative to installation, and especially those concerning taps on the transformers, must be carefully studied and double-checked to make sure that the panel is connected properly for the voltage to which it is subjected.

Filament Voltage

The filament voltage is an important factor in the life of electronic tubes. Maximum tube life can be realized only if the filament voltage is maintained within plus or minus 5 percent of the rated value. Most well-engineered industrial equipments include transformer taps or other means for adjusting the filament voltage to meet line voltage levels of plus or minus 10 percent. Maximum variation from rated voltage, however, can be realized only if the voltage variations, once the level has been set, are limited to plus or minus 5 percent.

Put tubes in the sockets in accordance with instructions on the diagram, or with the labels or nameplates on the panel. Great care must be exercised here because if tubes are placed in the wrong sockets they, as well as the equipment, are likely to be damaged. Double-check the positions of all tubes before power is applied.

With mercury-vapor tubes, hold the anode circuits open either by leaving the caps off or by disconnecting the anode leads until an initial warm-up period has elapsed. This initial heating period is necessary to boil off the mercury that has accumulated on the parts because of handling in shipment. The length of the warm-up period depends upon the tube used. Refer to the instruction book for the time required by the particular tubes used.

Initial warming up will be required only when a new tube is installed, and then only if the tube has been in storage in other than a vertical position. Otherwise, the cathode heater timer will protect the tube against damage.

After the initial warming up period, remove power from the panel and connect the anode circuits. The panel is now ready for the starting procedure outlined in the instruction book. This procedure should include such items as installation adjustments that can be made only when the panel is connected to the equipment to be controlled. Examples of these adjustments are the full phase settings on resistance welding controls; current limit on certain motor controls; sensitivity adjustments on photoelectric relays; and certain voltage adjustments.

Preventing Trouble

Many operating troubles can be avoided by preventive maintenance. It includes such items as checking the operating temperatures of mercury vapor tubes, since these tubes are adversely affected by wide temperature ranges. If the temperature is too low the tube will have a high arc drop that will not only result in low output and improper operation, but also in serious permanent damage to the tube. With grid-controlled thyratrons high temperature can cause loss of control which will result in improper operation of the equipment. With simple rectifiers, it can result in arc-backs that will put the equipment out of operation by blowing protective fuses or, if inadequate protection is provided, may destroy the tubes.

For the exact temperature ranges, refer to the instruction book or tube instruction sheets. The general rule is, however, that the ambient temperature should be at least 68 and not more than 100 deg. F. These are ambient temperatures, but they can be measured inside the enclosure near the bottoms of the tubes.

The real temperature to consider is the condensed mercury temperature at the coldest part of the tube, at the bottom next to the base for glass tubes, or on the radiator located at the bottom of metal tubes.

Large mercury vapor tubes, such as ignitrons used in welding service, are cooled by means of water. Check the outgoing water, which should never exceed 40 deg. C. or 100 deg. F.

If the equipment does not use mercury-vapor tubes but instead has only vacuum tubes or inert-gas-filled tubes, the operating temperature range will be greatly extended. Then the lower temperature limit is well below zero F. and the upper limit will probably be around 140 deg. F. and will be limited by wax capacitors and transformers rather than by the tubes. Thyratrons that will stand this wide temperature range include such tubes as the 2050, 2051, GL-502 and ELC-6J.

Check filament voltages occasionally by reading the primary voltage on the panel and comparing it with the panel rating, or to the tap used where a voltage adjustment is provided.

On welding or motor controls, it is desirable to check all new operations or set-ups by measuring the load current, if there is any possible danger of the tube rating being exceeded. With welding controls the value of the current must be determined by a peak-reading instrument, such as an oscilloscope, or by means of a pointer-stop ammeter. The duty cycle, or the time the current is flowing compared with the time that it is off, is also necessary to determine whether the tubes are operating within their rating.

Tube ratings under these conditions are given in the form of curves showing the various values of demand current permitted with various duty cycles. Each tube has a different curve for a different line voltage, and care must be exercised in using this information to make sure that the correct curve is used for the particular conditions of operation.

Necessary Instruments

In order to install, maintain, and locate trouble on electronic control equipment, it is necessary that suitable instruments be available and their use thoroughly understood. When instruments for testing electronic equipment have been made available and their possible uses have been realized, they will be widely used on other control and electrical equipment because with them the maintenance men can do better and more thorough work in analyzing trouble on all apparatus.

For work on electronic control equipment there should be available a portable voltmeter equipped with taps to cover a wide range of voltages, and with at least 1000 ohms per volt resistance. A number of such instruments are now on the market. Many of them include a tap switch that permits reading d.c. amperes up to 1 or 2 amp. and also enables them to serve as an ohmmeter. The ohmmeter, although not a precision device, is often very useful for checking the approximate resistance of apparatus on the panel. Figure 2 shows several examples of this type of instrument.

(The second and concluding part of this article will appear in an early issue.)

Inspection Plan Improves Plant Housekeeping

V. McCABE, Plant Engineer, Wright Aeronautical Corporation, Cincinnati

Editor's note: This article is presented exactly as it was written a few weeks before the end of the war. At that time the plant was in full production and the program described was functioning successfully. Today, of course, the plant facilities are being terminated, and the plan is no longer in use. The technique is fundamental in nature, however, and so worth passing on to industry.

GOOD HOUSEKEEPING never reached its present high level of attainment in the Cincinnati plant of Wright Aeronautical Corporation, largest engine plant in the United States, until the institution of a system of special housekeeping inspections made by maintenance supervisory personnel. By this system, supervisory employees and engineers of the plant engineering department inspect assigned areas not under their own functional jurisdiction, and report all violations of good housekeeping they observe. These reports provide the basis for a well-defined plan of remedial action.

One Department's Job

The organizational responsibility for good housekeeping in this plant belongs to the plant engineering department. One division of this department operates a sanitary force of about 900 workers, consisting of janitors, yard laborers, and restroom attendants, working three shifts. These workers perform the usual duties involved in keeping plant floors clean, and in servicing locker rooms, restrooms, and toilets. This same division also controls the work of chip removal from machine tools, cleaning and servicing machine tools and functional shop equipment, the reclamation of all oil and solvents, and the blending and dispensing of cutting and lubrication oils.

The job of successfully keeping a plant of almost 6,000,000 square feet of floor area clean, however, has proved to be more than one of mere delegation of such responsibility. It was apparent that the plant engineering personnel alone was not able to cope with the job. The idea of one department trying to pick up whatever every other department had thoughtlessly dropped was not the right approach.

Moreover, because good housekeeping was one department's functional responsibility, the natural result was that many other departments were not conscious of the necessity for their full cooperation. Hence the solution seemed to lie in educating all departments, through their supervisory personnel, as to their essential part in maintaining good housekeeping.

Here are the key details of the system that was developed to meet these

INTEROFFICE MEMORANDUM

Date December 18, 1944

To
Mr. R. B. Bruzina

CC:
C. E. Pruden
R. J. McKee
W. Des Marais
L. Kohl
C. Spensley
R. Fassl
L. Nelson
W. Hildebrand
A. B. Holmes
J. R. Meek, M. D.
G. Heth
E. W. Clark
W. S. Boynton
J. E. Burns

Subject
Plantkeeping

To attain and hold the standard of good plantkeeping, neatness, and orderliness insisted upon by Mr. Kennedy, you are requested to devote one hour of your time on Thursday, December 21, 1944, beginning at 9 a.m. to inspecting the south shop from Columns N to S.

Please write a report of all violations of good plantkeeping, neatness, and orderliness you encounter in this area, giving the location. Copies should be sent to all persons receiving copies of this memorandum. Return this inspection report to me the same day.

You will receive this report again on December 28, 1944, at which time you are to follow up to see whether the violations previously reported by you have been corrected.

Attached are a few examples of those things which contribute to bad plantkeeping, sloppiness, and disorderliness. We cannot, we must not, tolerate them.

V. McCabe

V. McCabe

Figure 1. Copies of this letter of instructions from plant engineer to each plantkeeping inspector, chosen from a panel of maintenance supervisors, are also circulated to supervisors of production and building maintenance in the area to be inspected

specifications and which is now getting the hoped-for results:

1. Inspection areas. The entire plant has been divided into 36 zones with definite geographical boundaries. One zone, for example, is described as South Shop, columns N to S.

2. Plantkeeping inspectors. A standing list of about 40 supervisory employees and engineers of the plant engineering department has been drawn up, who are to make whatever "plantkeeping" inspections are assigned to them by the plant engineer. In no instance is any man assigned to inspect departments under his own direct supervision.

3. Routine of inspection. A typewritten letter (Figure 1) is sent every three weeks by the plant engineer to a plantkeeping inspector requesting him to spend one hour at a specific date and time for inspection of an assigned inspection area. Issuance of these requests is staggered over the interval of three weeks for all inspection areas. Assigned areas are rotated periodically among the inspectors to avoid repetition by the same men.

But the next step is perhaps the most important one because it stimulates the needed cooperation of production forces. Copies of the plant engineer's letter are sent to those supervisors, often numbering a dozen or more, who are in any way responsible for production in that specific area, or are interested in its housekeeping.

To assist the plantkeeping inspector in recognizing violations of good conditions, lists of typical bad incidents are attached to the letter. Such lists cover bad practices in machine shops (Figure 2), and in offices, corridors, toilets, and restrooms.

The plantkeeping inspector immediately renders a written report of all violations found to the plant engineer. Copies of his report go also to the interested supervisors. This circulation has several important effects. In addition to the publicity given poor plantkeeping, it puts the onus of directing removal of violations immediately upon the men best able to handle it. It has thereby relieved the plant engineer's office of considerable detail in initiating remedial measures. Any violations by the plant engineering department is subject to its own specific attention.

4. Follow-up by reinspection. The original plantkeeping report is returned six days later by the plant engineer to the same inspector for a check on correction of violations. As reinspection report, citing all uncorrected violations, then is sent to the plant engineer and copies are distributed to supervisors in the same way as the original report.

5. Final action by plant engineer. Uncorrected violations on the reinspection report become the definite responsibility of the plant engineering department for rectification. The general plant inspector receives instructions to see the production foremen or janitors who have been derelict, and if further necessary, to refer any ignored item to the respective departmental head for conclusive action.

While the administration of this system involves appreciable paperwork, it is not burdensome and it is well worth the results. The lists of typical bad plantkeeping are made by a duplication process in bulk, but the form letters from the plant engineer to the plantkeeping inspectors are individually typed by his secretary. A routine has been established whereby all the information needed to produce these letters, including the names of supervisors receiving copies, is available to the secretary in a special file, so that the plant engineer need only add his signature to the outgoing letters presented to him. Incoming reports are quickly reviewed and analyzed by the plant engineer and referred to assistants for whatever action is indicated.

The inevitable consequence of this method of making supervisory personnel "housekeeping-conscious" has been a distinct improvement in plant housekeeping. Supervisors naturally are not anxious to have reports circulated to their associates and higher supervision exposing plantkeeping violations in their own departments. In fact, most of the supervisors of departments to be inspected see to it that their bailiwicks are in proper order before the time set for the inspection. Final evidence that the system works well, in the eyes of the plant engineer, is the fact that complaints from top management regarding poor housekeeping are now a rarity.

BAD PLANTKEEPING IN OFFICES, CORRIDORS, TOILETS, AND RESTROOMS

1. Dirty asphaltic tile floors needing cleaning with hot water to remove excess layers of wax. This is especially noticeable at borders
2. Floors in need of repair or replacement

BAD PLANTKEEPING IN MACHINE SHOPS

1. Machines and equipment leaking oil or other liquids on the floor
2. Dirty floors needing sweeping or mopping
3. Dirty waste receptacles needing sterilization and repainting
4. Accumulation of rubbish
5. Dirty conveyors from chips, oil, cigarette butts, wrappers, paper cups, etc.
6. Aisle markings indistinct - needing repainting
7. Dirty floor boards and mats
8. Clean and dirty rags not placed in proper containers
9. Partitions damaged or in need of painting
10. Magnesium cans in need of repainting
11. Dirty walls and columns in need of washing or painting
12. Equipment obviously in need of painting
13. Clothing and old shoes lying about - should be in locker rooms
14. Lighting fixtures in need of lamp renewals
15. Chip accumulation on floors
16. Skids and containers not lined up in orderly

Figure 2. Lists of bad housekeeping practices for machine shops and other locations are given to the plantkeeping inspector to assist him in recognizing violations that should be reported

City Firemen Boss Plant Protection Program

HOWARD L. FLECK, Factory Engineer, The Leland Electric Company, Dayton

TWO ACTIVE FIREMEN from the Dayton Fire Department share the responsibility for keeping the plant of the Leland Electric Company free from fire hazards. Their principal duties involve not only routine inspections of the entire plant property, but also instruction of employees in the proper handling of fire-extinguishing equipment. To these duties has also been added the supervision of the employee-safety program.

This unusual but profitable arrangement was brought about by an incident which revealed the advantages of having thoroughly trained men in this position. Management had always been aware of the possibility of a plant fire caused by poor housekeeping, defective electrical equipment, improper use and storage of flammable liquids, and, not the least dangerous, indifference or carelessness on the part of a workman. Consequently, originally a man was appointed as fire inspector to keep alert for fire hazards and to follow up their elimination.

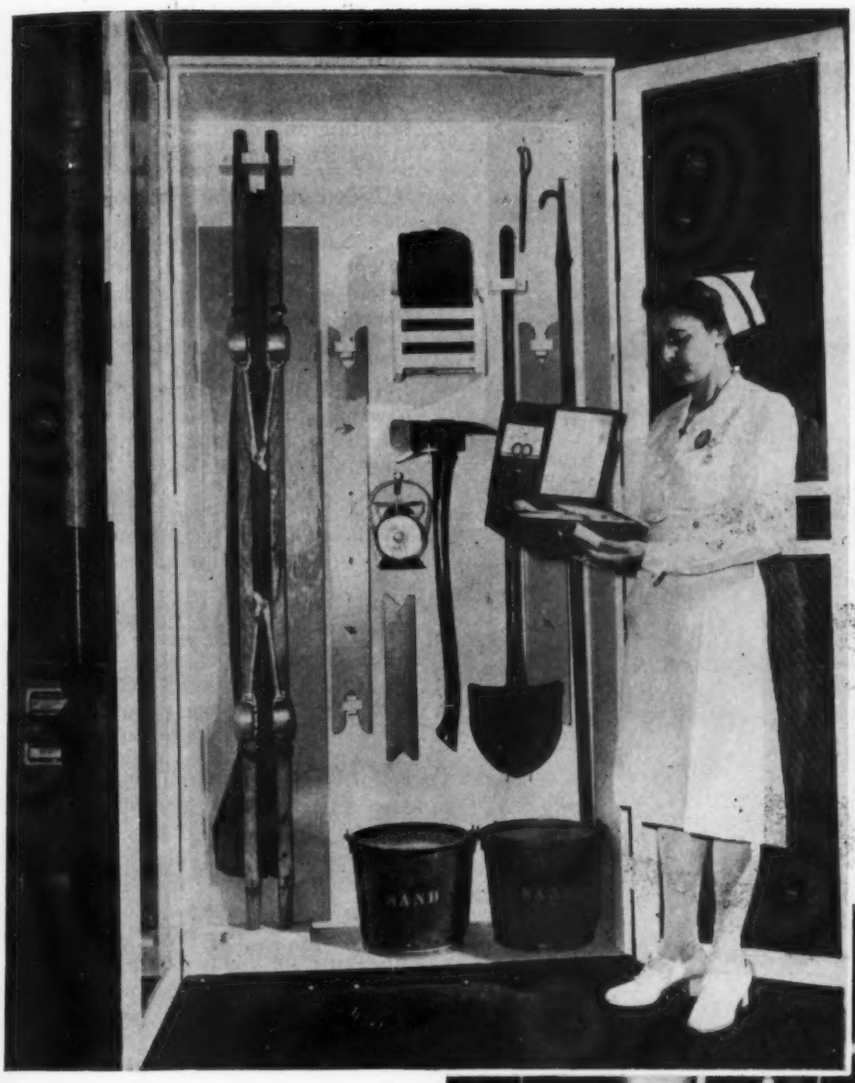
Effective plant maintenance lowers unit product cost

One day it became necessary to remove gasoline from an underground 600-gal. tank on adjacent property which had just been leased by the company. This operation, and that of filling the tank with water, was supervised by the Dayton Fire Department. In the course of this work, the fireman detailed for the job had occasion to walk through the Leland plant and look it over. His experienced eyes discovered hazards unobserved by the plant inspector, such as open conduit boxes where covers had been left off, wire joints not taped where they had been soldered, temporary wiring to machinery, switchboxes left open, boxes and trays piled in the aisles, and numerous other things that might have caused a fire, or would have hindered the fire department in fighting a fire.

This experience made it obvious that a "professional" fireman was needed as a fire inspector. Accordingly, the Dayton fire chief was questioned as to the possibility of employing two of his firemen on their days off. This plan was agreed to, and has worked out to the mutual benefit of the company and the fire department.

Because fire prevention is so closely allied with good housekeeping and employee safety, the two inspectors have been given complete supervision over these other two programs. Both men have been sent to several fire and safety schools and conventions to view new methods and equipment, not only for fire-prevention but also for safety. A copy of the reports of all such trips is always given to the

Valves controlling special sprinkler lines to baking ovens and ventilating stacks are marked with specific instructions in case of fire. Bank of portable foam extinguishers underneath is ready for small oven fires



fire chief and city manager. These officials likewise receive copies of all recommendations made in the plant by the firemen-inspectors, who are considered responsible to the city at all times. For instance, if a city emergency demands the use of reserves, the city fireman on duty at the plant can be called to duty. The city department has profited in this plan by gaining a more intimate knowledge and understanding of industrial fire-prevention problems than it could have obtained otherwise.

The firemen-inspectors do not have any regular hours to report on their "company" working day. They walk into the plant at any time, 7 a.m., 12 noon, or as late as 10 p.m. This helps to keep every employee alert.

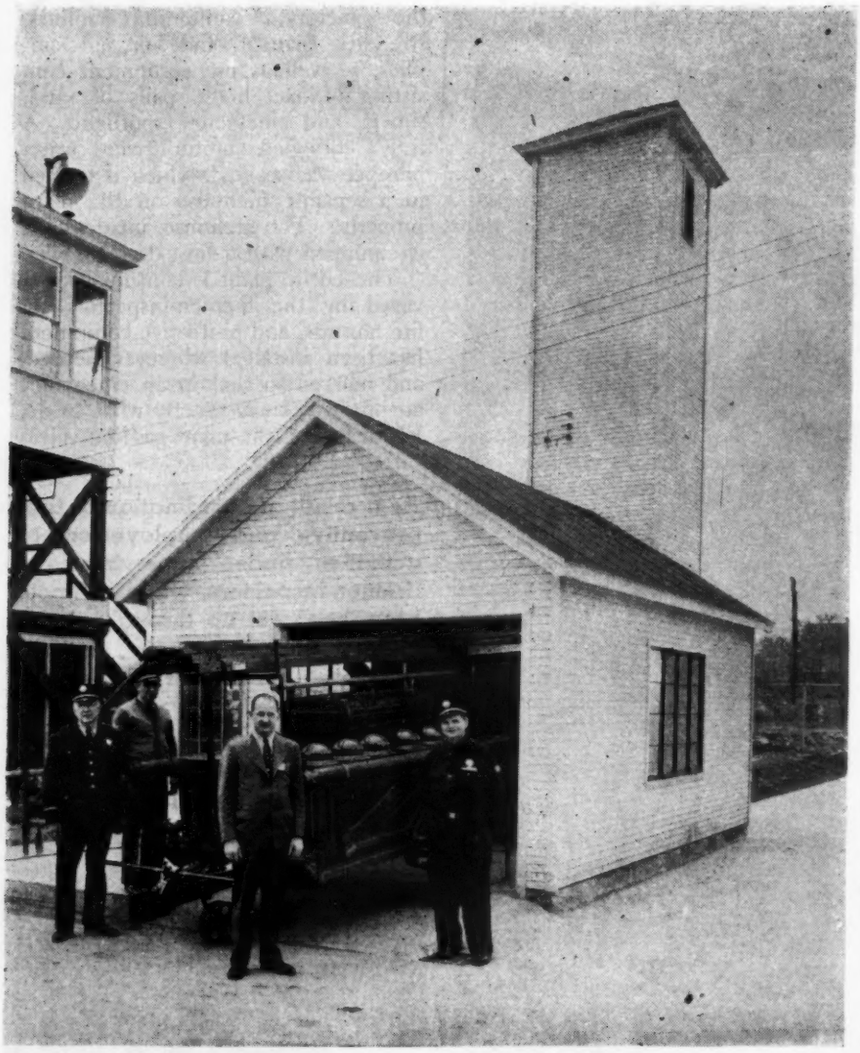
Among the duties of the firemen-inspectors has been the instruction of first aid classes, and also training a special group in the handling of fire hose, all kinds of extinguishers, and other firefighting equipment.

On the advice of these two men, cabinets have been set up throughout the factory, containing splints, stretcher, blanket, and first aid supplies, as well as fire equipment consisting of axe, hook, pails of sand, shovel, and emergency spotlight. A fully equipped motor-driven water pumper was secured, which is located in a separate firehouse on the plant property. The firehouse, incidentally, is equipped with a hose-drying tower.

The entire plant is continually surveyed by the firemen-inspectors for fire hazards, and protective equipment has been installed wherever needed, and marked so that in an emergency anyone will know exactly what to do. For instance, the main gas-line valves

As a result of coordination of fire-preventive and employee-safety activities under supervision of firemen-inspectors, white cabinets have been set up throughout the factory building, with first-aid equipment for fires or accidents

Because in an emergency nothing can be left to guesswork, main valves of gas supply line are painted bright red and clearly marked for quick shutoff



Efficiency of the plant firefighting equipment has been raised to include its own water pumper, for which twice-daily starting tests are recorded in log book. Note hose-drying tower in right background

are painted fire red, with a large sign telling how to shut off gas from all buildings. Also, baking ovens are protected by sprinkler systems with valved controls located in a manifold nearby, bearing simple instructions for operation in case of fire in certain ventilating stacks. At this same point, a battery of foam-type extinguishers is kept for portable hand-use for minor outbreaks.

Inspection and Education

In their safety program the firemen-inspectors are likewise diligent to eliminate all accident hazards, both by continual inspection of plant machinery and equipment, and by education of employees in the use of protective devices and clothing. Their work, for example, includes making recommendations for machine guards, instructing truckers in the proper handling and placement of material, and enforcing the use of goggles, and safety caps for the women. As a result of these efforts, the plant has gradually reduced its accident record to a point where a no-accident month is not unusual.

One of the unusual results of the employment of these firemen as inspectors was their initiation of a plan for smoking in the plant, which came out of a special trip to a large plant in Cleveland to see how it handled its fire and accident hazards. At first Leland company officials, and even the city fire chief, disapproved the plan. In Ohio the regulation of smoking in industrial plants is a matter of local ordinance. However, after a thorough discussion of all points, it was agreed to try it out.

Smoking areas were installed, and danger zones were marked off where definite hazards prohibited smoking at any time. Six specific rules were set up, explaining where and when employees could smoke. They are, in substance:

1. Smoking is allowed in all manufacturing and office areas except aisles or restricted areas.

2. No smoking in restrooms.

3. Smoking is permitted at all hours except during the 45-min. period before quitting time, to enable detection of a burning cigarette left around by a careless worker.

4. All employees who smoke must have an ashtray at their stations, which is to be kept clean, and emptied before quitting time.

5. Cigarettes are not to be thrown on the floor, into trash containers, in beds of machines, or out windows.

6. Good housekeeping must exist in every department. There must never be any paper, rags, boxes, and so forth lying around on the floor. Trays, tools, and parts are to be put away and kept in order at all times.

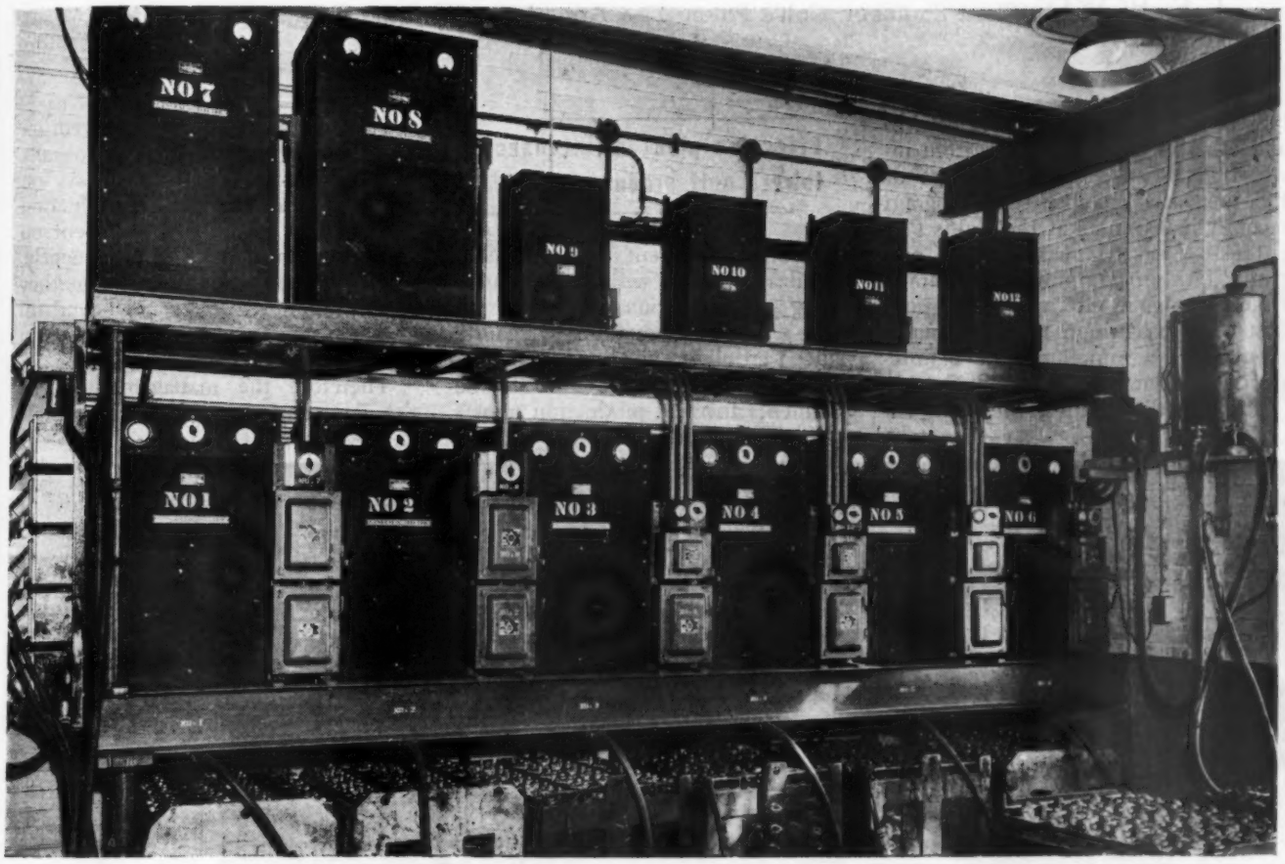
Infraction of any one of these rules results in a penalty of withdrawal of the smoking privilege for 24 hours in a department, or in the entire plant, including the offices, if such plantwide severity is necessary. Almost needless to say, no employee wants to be the cause for any such discipline.

The results have been highly gratifying from several viewpoints. In the first place, of course, workers appreciate the smoking privilege, and whatever irritation has existed because it was formerly denied them has been entirely removed and replaced by goodwill. Second, the fire hazard from unauthorized and uncontrolled smoking has been practically eliminated. Third, production has ceased to suffer from unauthorized "time out" in restrooms. Before smoking was permitted, an actual check revealed 100 or more workers smoking in restrooms at all times, which involved a loss of 800 man-hours each shift. Finally, respect for the objectives and program of the firemen-inspectors has won employees' cooperation.

While working in the plant, the firemen-inspectors wear their regulation uniforms and badges. It is believed that this practice, together with the knowledge of fire-preventive and employee-safety procedures demonstrated by these men, gives them a prestige that could never have been gained by a "civilian" fire inspector. The attainment of plant and employee security, far beyond that anticipated, is justifying management's opinion that the plan is good.

Low-Cost Battery Charging

WALTER B. ATCHINSON, Electrical Engineer, The Chapman Valve Manufacturing Company, Indian Orchard, Mass.



With these battery-charging panels operator has only to plug in the leads and set a switch. Four small units, at the upper right, handle the batteries used in motor-driven hand trucks

A SAVING of more than $3000 a year was made by a change in the equipment used for charging the batteries of the industrial electric trucks used at the Chapman Valve Manufacturing Company.

At present there are 28 battery-driven trucks of different types in operation. Forty-six batteries are required to keep these trucks in service.

Charging current formerly was provided by a motor generator set consisting of an a.c. motor driving two 20-kw. d.c. generators. The generators delivered 125 volts, which was cut down to approximately 60 volts by means of resistors. Twelve manually operated charging panels were used. Hence it was necessary to employ an operator to cut down the charging rate and disconnect the batteries when they were fully charged.

This old motor generator set had seen its best days and gave a good deal of trouble. When batteries were being charged at the full rate there was considerable sparking at the brushes of the generators, which meant that the commutators required a good deal of attention. The brushes had to be shifted frequently, and the operator was pretty busy.

Aside from the cost of attendance and maintenance, no one realized how inefficient this method of charging the batteries was, nor how much electrical energy was wasted in the process, until a new outfit was installed.

This equipment comprises eight panels for charging large batteries, and four panels for the small batteries used in the motor-driven hand trucks. Each panel is equipped with its own dry-type rectifying unit, time clock, and meter. The panels are automatic in operation. When a battery is put on charge it is necessary merely to turn the time clock switch to the number of hours the battery should remain on charge. The charging rate is automatically tapered off. Then at the end of the desired charging period the battery is disconnected from the line.

After the new charging panels had been put in operation tests with a watt-meter showed that they drew only about 50 percent as much current from the line as was taken by the old motor-generator set, while charging the same number of batteries. In addition to this saving in power cost, since it was no longer necessary to keep an operator on duty in the charging room, he was assigned other work and a further substantial saving was made.

Preventive Maintenance Cuts Downtime 87 Percent

J. F. BOYD, Plant Engineer, Colt's Patent Fire Arms Manufacturing Company, Hartford

Effective plant maintenance lowers unit product cost

PROVIDING THE INSPECTORS of electrical and other equipment with written instructions is an important feature of the preventive maintenance program recently inaugurated at the Colt's Patent Fire Arms Manuafacturing Company. This program, in turn, stemmed from a change in internal organization, based on recognition by the management of the importance of maintenance in reducing production costs.

Prior to this change, the plant engineering department was connected, organization wise, with the manufacturing and production control division. As a result, the functions of maintenance were always given secondary consideration in the desire by other departments to meet production quotas.

Talk about an ounce of prevention being worth a pound of cure usually fell on deaf ears. There was always too much of a rush in getting production out to allow any time to be spent on preventive maintenance. Consequently, when maintenance jobs were done they usually amounted to a general overhaul at a considerable loss of production time and money.

Therefore the management made the plant engineer directly responsible

Disconnect switches are inspected every two months. The inspector follows a prescribed routine

CONTACTORS

Following is the correct maintenance procedure which all electricians in this plant should follow when making periodic inspections of Contactors and Magnetic Motor Starters. This check should be made periodically every two (2) months.

1. Check adjustment of mechanical interlocks to see that the two contactors in question cannot make contact at the same time.
2. Check contact points for pits. If metal has been added to the surface, it may be removed but if the contact is pitted, it should be replaced. Never file a silver contact. If it cannot be dressed with a very fine emery cloth it is beyond

SAFETY SWITCHES

Following is the complete maintenance procedure which all electricians in this plant should follow when making periodic inspections of Safety Switches. This inspection should be made once every year.

1. Check fuses and leads for excess heating, and if overheating exists, determine and correct the cause.
2. Check the switch for broken parts and replace any if necessary.
3. See that all blades and clips are free from dirt.
4. See that blade and fuse clips have good compression.
5. Check the operation of the quick make and break mechanism, making sure that all poles make and break at the same time and with the same speed.
6. Lubricate the blades with vaseline or any other grease that does not contain a soap base.
7. Check the blocks for looseness to enclosure.
8. Tighten all mounting screws.
9. Lubricate handle mechanism with machine oil.
10. Tighten locknuts on conduit.
11. Tighten all binding screws.

J. F. Boyd
Plant Engineer

JFB:BG

Here are two sample check lists, covering safety switches and contactors and starters, respectively. With such check lists there is little chance that anything will be overlooked when inspections are made

to the vice-president in charge of arms manufacturing. Plant maintenance was then put on an equal basis with the production, manufacturing, and quality departments.

The next step was to make certain changes within the plant engineering department designed to coordinate properly the maintenance functions in the three Colt plants, all geographically separated, which were being operated at that time.

The main plant, covering 1,000,000 square feet was so much larger than the other two, each of which contained 250,000 square feet, that its maintenance organization had to be considerably greater. A maintenance superintendent was placed in each plant, and in the two smaller plants the maintenance foremen reported directly to these men. In the main plant the maintenance superintendent is assisted by a master mechanic who supervises all the foremen of the mechanical functions, a service superintendent who supervises all of the service departments, and a chief electrician.

Efficiency Increased

All maintenance functions, some of which did not formally come under the plant engineer, were then brought together in one building in each plant. After living together for a while the various maintenance departments began working more harmoniously with one another, each realizing the others' problems. This move alone made a good showing in increased efficiency.

Preventive maintenance programs were set up for all types of equipment in the shop. Check lists were prepared for the various tradesmen to use when making their periodic inspection and tests. On these sheets each item to be checked is listed in the proper order, with explanations as to what to do when certain items are found to need correction.

Other listings were made up for the machinists to use when inspecting machines for mechanical condition. These instructions were found to be helpful in conducting the preventive maintenance programs, by insuring that vital points requiring inspection are not overlooked.

The high-voltage power supply is 11,000 volts, three phase. The distribution system operates at 220 volts, both two and three phase. Hartford

has always had a two-phase system but of late years the use of three-phase has been encouraged. It was, therefore, necessary to provide both two- and three-phase distribution. Sub-distribution centers were set up having a capacity of 1000 kva. each at 60 percent load factor. These distribution systems are periodically checked for lug tightness, condition of safety switches, and insulation condition.

Spare motors are kept on hand for emergencies. They range from fractional-horsepower pump motors to 50-hp. lineshaft motors. Because of the three-shift, seven-day work week, shutdowns for cleaning were out of the question. To meet this situation a lunch period cleaning crew was set up on all three shifts, these crews taking their lunch time either before or after the regular period. The motor crews are equipped with portable safety cleaning fluid tanks, air hoses, spray nozzles, and all kinds of special tools and instruments to make their work easier and more effective.

Insulation resistance tests are always taken and the readings recorded. If a reading approaches the danger point, the motor is immediately replaced with a spare. These spare motors are painted bright red so that they can quickly be seen during a visual inspection of a department.

Most of the general lighting consists of 400-watt high-intensity mercury vapor lamps enclosed in diffusing units and 85-watt fluorescent fixtures. Cleaning of these fixtures is done periodically on a routine basis. Handling of the high-intensity mercury vapor lamp fixtures presented a problem, because of their high temperature. This situation was met by providing the cleaning crews with extra units that are easily put in place of the hot fixtures by means of quick-disconnect plug-in type hangers.

The hardening room requires one of the most elaborate preventive maintenance systems. All potentiometers and pyrometers are checked daily for all points of failure. Once each month each instrument is thoroughly cleaned, disassembled, and all parts are inspected for signs of wear. At this time the calibration of the instrument as well as the thermocouples are checked against standards.

Furnace Inspection

All furnace ribbons are inspected once a week for grounds, loose studs, and broken-down insulation.

The time clock system is cleaned and overhauled on a yearly cycle. Gears and gear trains are replaced with reconditioned units. Cleaning during working hours was made possible by the use of spare time clocks while the others are being cleaned and connected to check runs. Two master clocks were installed side by side so that either can be taken out of the system.

Since the battery is the most costly item on an industrial electric truck, a great deal of attention is given to its care. The drivers were instructed to note any abnormal conditions and report them to the maintenance dispatcher. Batteries are charged nightly and at this time, in addition to the normal water level, gravity, and voltage tests, inspections are made for grounds, loose bolts and braces, and cleanliness. All batteries are steam cleaned monthly, and all connectors and straps are covered with a corrosion preventive compound.

Daily Report

Each maintenance man makes out a daily report card covering the work that he did during the day. This card shows when he started and finished each job, what department it was in, the number of machines involved (if it was a machine call) and a complete explanation of exactly what he did and how long it took. There is also a column for explaining the cause of the trouble, which all maintenance men are encouraged to investigate. If the repair was of a temporary nature, that also is noted.

These report cards are turned over to the foreman each day for review. The time cards are also made up on the basis of this report. Reports are then turned over to a clerk who transfers the information to other cards set up for each piece of equipment. In this manner an exact history has been accumulated for every repair, routine inspection, or trouble call on every machine.

These machine records have proved invaluable in tracing troubles and their relationship to previous repairs. A glance at the card shows the foreman when the last preventive maintenance check was made. When repairs become heavy on a particular machine, the plant engineer can quickly analyze the feasibility of replacing it. Repairs of like nature quickly show up and serve as a check on the effectiveness of a previous repair job.

As an example, when the cards were first set up, one showed that a pump was primed on a certain drill press 18 times in 2 days. Each call on this machine was handled by a different man, none of whom knew that the calls were repetitive. Each man considered the job to be a natural routine call. When all reports were transferred to the card for this drill press, the repetition was brought to the attention of the maintenance superintendent, who had a check valve installed to

The maintenance dispatcher gets a trouble call. Switches in box at left control lights of seven different colors in a bank in the maintenance shop. The color indicates which tradesman is wanted. Call slips are placed in holder just inside window

Spare parts of a critical nature, for production and other equipment, are stored in the maintenance stockroom. Placed in accordance with a code system, parts are easy to find in an emergency

liminate any need for future priming.

Every day a list is made of all of the achines down for repairs since the revious day. This list gives the name f the machine, the department where was located, what the trouble was, hen it was shut down, and the status f the repair work. The machine appears on the list every day until it is gain in production. This daily report circulated to all department heads nd posted on the maintenance bulletin board, where it serves as a strong centive to all maintenance men to ep the machinery running.

All Calls to One Man

It was arranged to have all trouble lls, regardless of their nature, received one maintenance dispatcher who trained to ferret out complete information from the calling party. This p-up eliminates duplicate calls and ures enough information for the desman so he knows what materials d tools to take out on the job.

To insure prompt, efficient handling of trouble calls, certain men of each trade were assigned to this work. The maintenance dispatcher has a switchboard at his desk in the office with a separate switch for each type of service called for such as electrical, mechanical, belting, plumbing, millwright, carpenter. These switches control a bank of colored lights out in the maintenance shop, a certain color being assigned to each type of call.

When a call for an electrician is received, for example, the dispatcher turns the red light on. If a plumber is called for the green light is turned on.

When a tradesman sees his light is on, it is his duty to leave his assigned bench work and handle the call. The light remains on until the maintenance job slip is picked up.

When the job is completed the tradesman calls the dispatcher from the shop, gives his location, and asks whether there are any other calls from his locality. If there are none, he returns to the maintenance shop and resumes the bench work that had been previously assigned.

Interest of the men in seeing that the calls are picked up promptly and that the lights are not on too long is keen.

This system has worked very well in enabling calls to be handled promptly, without excess manpower.

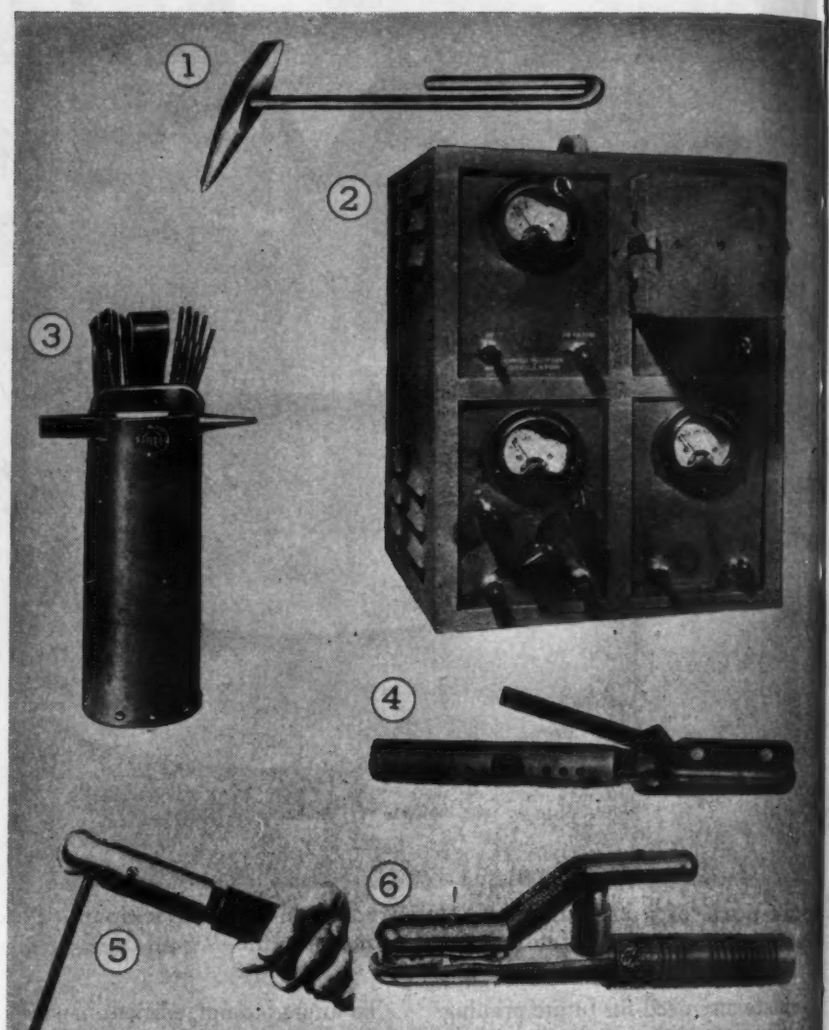
Spare Parts in Stock

A maintenance stockroom was set up under a code system to carry spare parts of a critical nature for all production and other equipment. The master mechanic and the chief electrician determine in advance which parts of equipment and machines are critical, and spares are kept in stock.

After six months of operation in the manner described, the plant engineering department was able to release 30 percent of its personnel for other work, while the percentage of machines down for repairs at any one time was reduced from 4 percent to 0.5 percent.

Welding Equipment

Welding equipment introduced to you by *Factory* during the past 12 months is reviewed here to give you a quick one-year summary



ARC TORCH—Electric arc welding torch is said to provide an electric flame of approximately 9000 deg. F., a pure heat without oxygen or other gas to contaminate the weld. No pressure is needed to force molten metal away or to blow holes in light sections. The torch can be used with any a.c. or d.c. electric welder. Mid-States Equipment Company, Chicago.

CHIPPING HAMMERS—have handles made of high-grade ⅜-in. round steel, with special hand grip to absorb shock when chipping, and to hook on belt when not in use. Type E has combination drift and chisel, and Type F is equipped with two chisels at right hand angles on head. Chicago Manufacturing & Distributing Company, Chicago. (Figure 1)

CURRENT FORCE RECORDER—Portable unit records current and force in resistance welding machine electrodes. Recorder consists of electrode holder and amplifier-oscillograph unit which operates from 115-volt, single-phase, 60-cycle power source, and is composed of single-channel amplifier, oscillator, power unit, and small magnetic oscillograph. General Electric Company, Schenectady. (Figure 2)

ELECTRODE CASE—To prevent scrapping of welding electrodes because of cracked and chipped flux coating, a heavy harness leather case carries a supply of electrodes suspended from welder's belt. Extra division is provided for carrying a weld cleaning tool. Capacity is 8 to 10 pounds. Atlas Welding Accessories Company, Detroit. (Figure 3)

ELECTRODE HOLDER—is of the resilient-jaw type, fully insulated. Removing or re-attaching front assembly may be accomplished by hand, without shutting down the welding machine. Holder may be left anywhere without danger of an arc, if operator removes front when leaving the job. Detroit Electrode Holder Manufacturing Company, Detroit. (Figure 4)

ELECTRODE HOLDER—Features claimed for screw-type, armorclad insulated electrode holder are durability, safety, and minimum operator fatigue. Head is enclosed in sheath of aluminum armor that protects insulation, resists weld spatter, and eliminates accidental contact with welding circuit. Accommodates electrodes up to ¼-in. diameter. General Electric Company, Schenectady. (Figure 5).

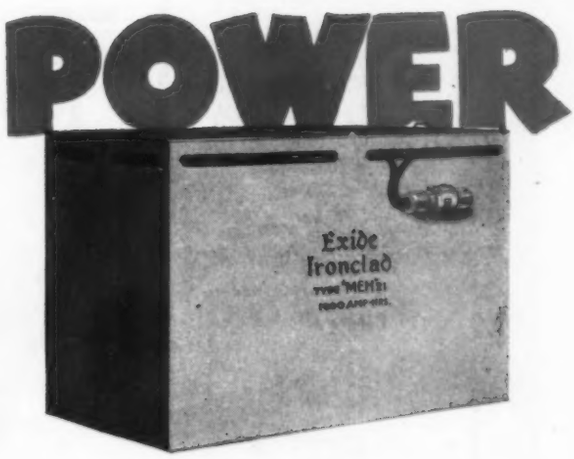
ELECTRODE HOLDER—Models A-4 and A-5 insulated, tong-type electrode holders, which take rods to ¼ and ⅜ inch respectively, show a 40 percent weight reduction over manufacturer's other tong-type holders of the same capacities. Jackson Products, Detroit. (Figure 6)

ELECTRODE HOLDER—Having a 300-amp. current rating with ample capacity for overload, holder handles electrodes ranging from 1/16- to ¼-in. diameter. Jaws, made of high-conducting and wear-resisting copper alloy, are claimed to withstand rough treatment and are guarded from touching the work by a replaceable spring steel insulating guard. Can be used on either

When electric industrial trucks, powered by Exide-Ironclad Batteries do the lifting, hauling and stacking of materials, you can be certain of *full shift availability* hour after hour, day after day. There is no down-time for adjustments, repairs or other attention.

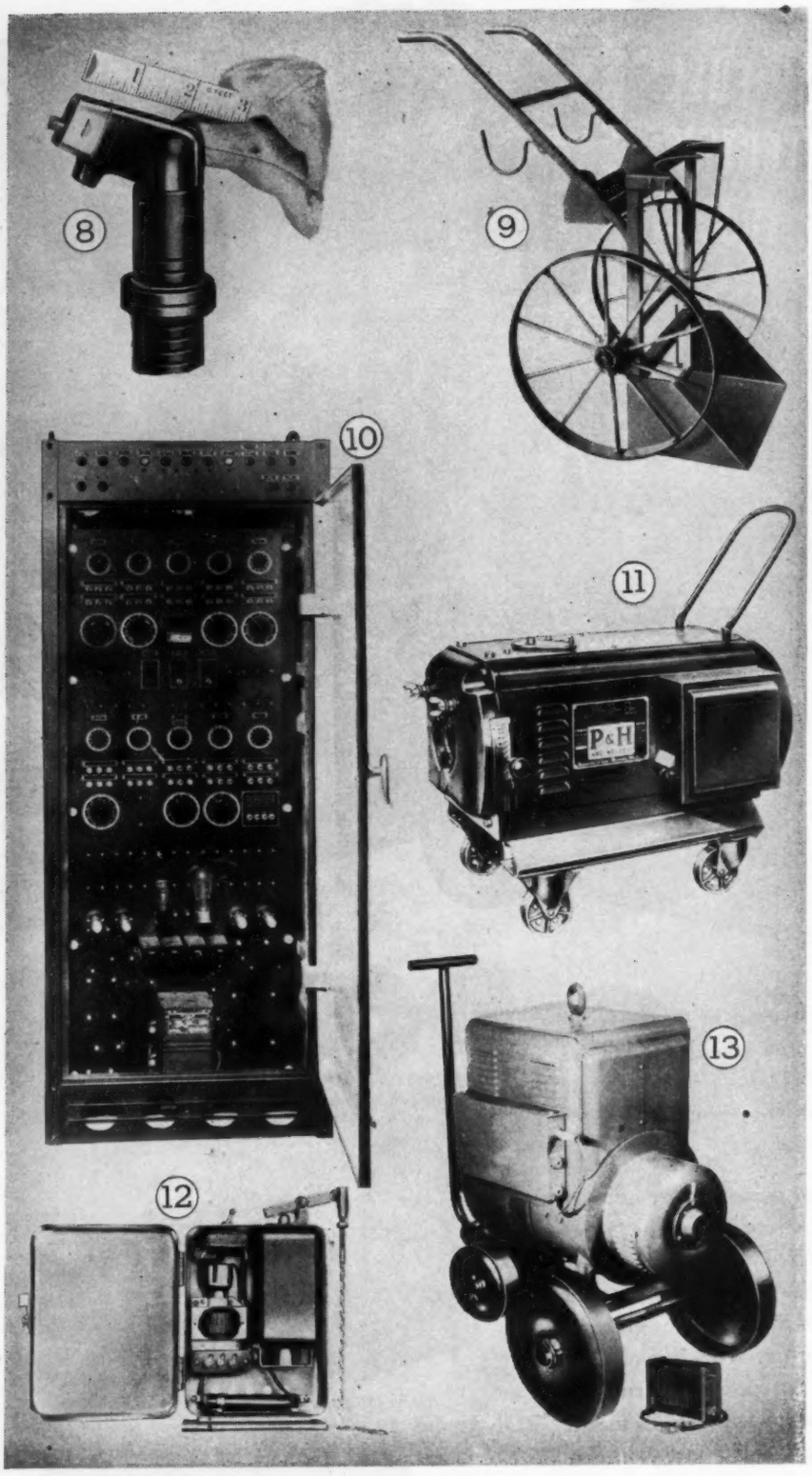
Exide-Ironclad Batteries have the *high power ability* needed to meet the high-kilowatt demands encountered in "stop and go" materials handling. They provide *high maintained voltage* throughout discharge, thus assuring a uniform rate of operations. And the *high capacity* of Exides keeps electric industrial trucks on the job during every working minute of the shift. You can always count on powerful, rugged Exides for dependability, long-life, safety and ease of maintenance. *These are the factors which add up to lower handling costs per ton.*

Write us for a FREE copy of the bulletin "Unit Loads," prepared by The Electric Industrial Truck Association. It tells how to cut handling costs up to 50% . . . covers latest developments in materials handling . . . and includes actual case histories.



Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
Exide Batteries of Canada, Limited, Toronto



a.c. or d.c. The Lincoln Electric Company, Cleveland. (Figure 7)

ELECTRODE HOLDER—is designed to allow unobstructed visibility while welding, maximum accessibility, and fast loading and reloading. According to the maker, holder increases usable portion of electrode, because only ½ inch is needed for current contact in holder jaw. An extension of holder allows stub end of rod to be projected into proper position for welding. National Cylinder Gas Company, Chicago. (Figure 8)

ELECTRODES—known as Rexaloy, are for all ferrous metals and alloys. Operate with either a.c. or d.c. (straight or reverse polarity) machines, and coating is metallic, blending with core rod instead of forming slag, maker states. Said to be unaffected by moisture. Deposits can be forged and heat-treated, and have Brinell hardness rating of 300 to 687. The Sight Feed Generator Company, Richmond, Ind.

TRUCK—for the acetylene gas welder, accommodates one gas and one air cylinder, cradles to stabilize cylinders, and is easy to handle. Handles are equipped with cross bar for mounting equipment. Hooks welded on handles provide for hanging gas hose. Tool box is mounted on swivels so that tools are constantly in level position. Palmer-Shile Company, Detroit. (Figure 9)

WELD AND SEQUENCE TIMER—provides time and current adjustments for welding heavy sections of air-hardenable steels. Known as Type CR7503-F170, it is designed for use with a G.E. ignitron contactor and a heat control panel, but also can be used with G.E. spot welding controls that include the phase-shift method of heat control. General Electric Company, Schenectady. (Figure 10)

WELDER—Service range rating of from 60 to 375 amps. is provided by Model WA-300 welder. Unit retains two-part construction, single heat control, visual current calibration, and adaptability to parallel operation where higher amperage is needed. Features polarity reversing switch, and removable stator, plus overload protection both for contacts and for low-voltage magnetic starter. Harnischfeger Corporation, Milwaukee. (Figure 11)

WELDER IDLING DEVICE—mercury-type, automatically shuts down gas engines of arc welders to idling speed 12 to 15 seconds after operator has stopped welding. Striking arc resumes speed. Device and governor are linked with throttle, and when welding, idler can be made inoperative by opening toggle switch without affecting welder or gasoline engine operating characteristics. The Hobart Brothers Company, Troy, Ohio. (Figure 12)

WELDING ATTACHMENT—is claimed to make it possible to weld from 10 amperes up through maximum rating of the machine without any dead spots. Suitable for use where work may vary from heavy to light gages. By plugging the jack into three alternate positions—low, medium, or high—it is possible to get three additional ranges of amperage. Intermediate points can be obtained by use of field rheostat. The Hobart Brothers Company, Troy, Ohio. (Figure 13)

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INCOMING MATERIAL—departmental distribution—outgoing finished products—wherever material movement takes place, there you will find Hyatt Roller Bearings contributing to speedy, easy handling.

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MAINTENANCE SHORTS

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Will be paid for the best Maintenance Short published in each issue of *Factory* until further notice. (Do not submit Shorts that deal with production processes.)

All other Shorts accepted for publication will be paid for at attractive rates.

Contributors may submit as many items as they wish. Mail yours today!

Prize-winning short this month, "Simple Hoist, Made of Parts on Hand, Cut Cost of Concrete Job," on page 166

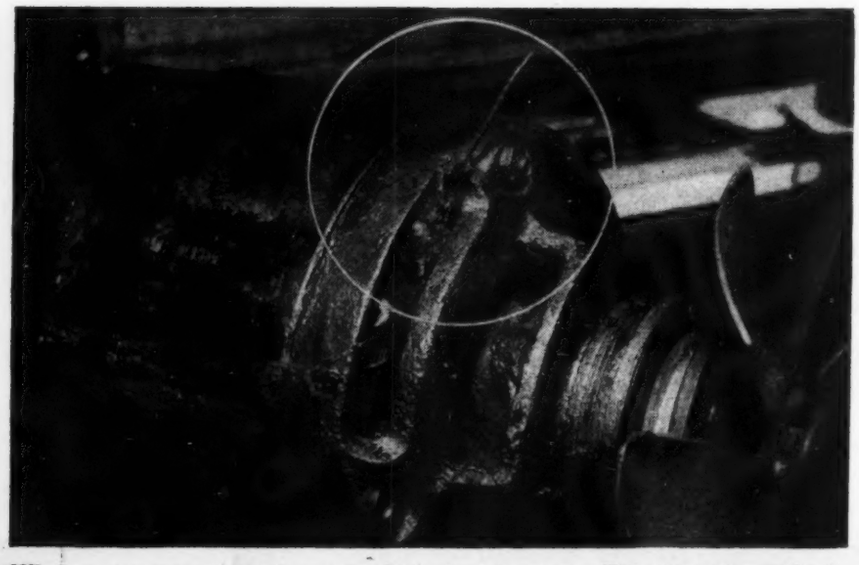
Moral: Never Doubt the Power of a Mouse

P. H. WILMARTH, Plant Engineer, Blanchard Machine Company, Cambridge, Mass.

It all goes to show that anything can happen in the maintenance department. No one has tried mouse-power to operate a refrigerating compressor, but we know that mouse-power is enough to stop one.

Our experience began when an electric drinking fountain shut down mysteriously one morning. The electrician reset the thermal relay, and in a few minutes it tripped off again. The compressor turned freely with the belt off. The belt was not too tight, and the bearings were cool.

So we took out the motor for a detailed examination. Then we found the body of a mouse caught in the fan on the rotor. The mouse evidently had crept inside the motor while it was shut down in a cooling cycle, and became trapped when the thermostat started the compressor.

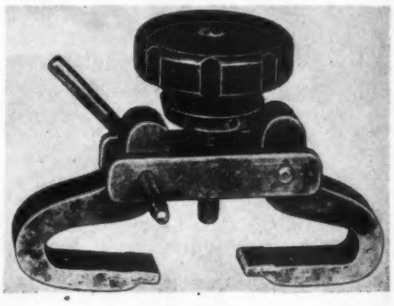


When mouse meets motor—something has to give. This time it was both. Picture shows mouse's tail sticking out from aperture in endbell. Body of the mouse may be discerned in the aperture

Pulling Gears in Restricted Areas

WILLIAM HOUSTON, Westinghouse Electric Corporation, East Springfield, Mass.

When gears have to be pulled in a restricted space, the gear puller shown in the illustration will do the job most conveniently. It is made in two parts, so that it can be easily disassembled and then assembled over the gear. It is taken apart by removing the pin which acts as a pivot for one arm. Then it is placed on the gear to be pulled, and reassembled with the arm in place.



Gear puller, which comes apart and goes together easily, is especially useful for tight spots

The construction of this gear puller makes it possible to pull many gears and wheels that are in "inaccessible" places, and which could not be pulled with an ordinary puller.

Emergency Stamp Use Regulates Rush Orders

R. A. D'AMATO, Plant Engineer, The Flintkote Company, East Rutherford, N. J.

In the East Rutherford plant of The Flintkote Company, work orders for maintenance are originated by operating executives. Naturally, each superintendent feels his own work is the most important, and therefore wants it done first.

This feeling often led to overzealousness by the superintendent in claiming the importance of his work order, and made it difficult for the plant engineer to decide the relative importance of the jobs on hand, and which ones should be given priority. Some jobs of only minor importance were likely to be given first at-

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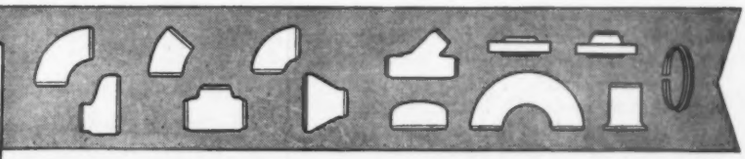


THE COMPLETE LINE OF WELDING FITTINGS AND FLANGES

tention, because they were marked "RUSH," while other, more deserving, ones were kept waiting.

The introduction of an "emergency" stamp not only has easily corrected this situation, but also has insured immediate attention to genuinely rush jobs. A rubber stamp, reading "EMERGENCY" in ½-in. capital letters, has been issued to the plant manager and the plant engineer. Now, when the job is urgent, a shop superintendent takes his work order to the plant manager, and pleads his cause. Unless he is convinced beforehand that he has a good case, he will not attempt it. The plant engineer uses his stamp for work he himself initiates that is of an emergency nature. Obviously, he will not upset his own schedule unless absolutely necessary.

As a result, an average of only one emergency order a month has come through. In such cases, all possible effort is concentrated on the rush job, and it really gets done in a hurry, usually within 24 hours. Other orders are scheduled in the order of date received, tempered by the plant engineer's knowledge or judgment of their relative importance.

•

Reversing Air Drill Provides Fast Traverse

R. G. HUMMER, Master Mechanic, Defiance Machine Works, Inc., Defiance, Ohio

We have several old-type planers in our plant that are not equipped with rapid traverse mechanisms on either the heads or cross rails. Other than that these machines are in excellent condition, performing their work as accurately as new machines. We increased the rate of travel of the tables, but the time and effort consumed by the operators were both costly and fatiguing. The cost of applying conventional rapid traverse mechanisms was prohibitive.

A satisfactory and inexpensive method of overcoming this handicap had to be devised. We now suspend a reversing air drill beside each machine, counterbalancing it over pulleys. The chuck of the drill is replaced with a suitable socket to fit the ends of the feed screws. The operator merely lowers or raises the drill to the desired screw, pushes the socket over the squared shaft, then operates the drill in the desired direction. This gives us a rapid traverse on all movements at a nominal cost.

Simple Hoist, Made of Parts on Hand, Cut Cost of Concrete Job

H. B. McDERMID, Cincinnati

A simple device that was easily assembled from materials available in the plant saved a good deal of time and labor when strengthening a light brick wall that had tipped badly, probably because the foundation had settled.

This wall, which was at one end of a lumber storage shed, was 8 inches thick, 15 feet high, and 100 feet long. It had tipped so far that the roof timbers had slipped off at one corner.

The nearly flat roof was jacked up and blocked, slightly above normal position, after which the wall was forced back into position by jacks and shores. Since there were no solid parts of the light building to which the wall could be anchored, it was decided to set up several concrete pilasters along its outer surface, and tie the wall to them with heavy anchor bolts.

Placing the forms and anchors presented no problem, but the matter of pouring some 15 yards of concrete at commercial speed was not so easily solved. The concrete had to be poured into the tops of forms 15 feet high, and no hoisting apparatus was available. Because of the small quantity of concrete, use of a tower was out of the question. Building a ramp to wheel the concrete up in barrows also was ruled out.

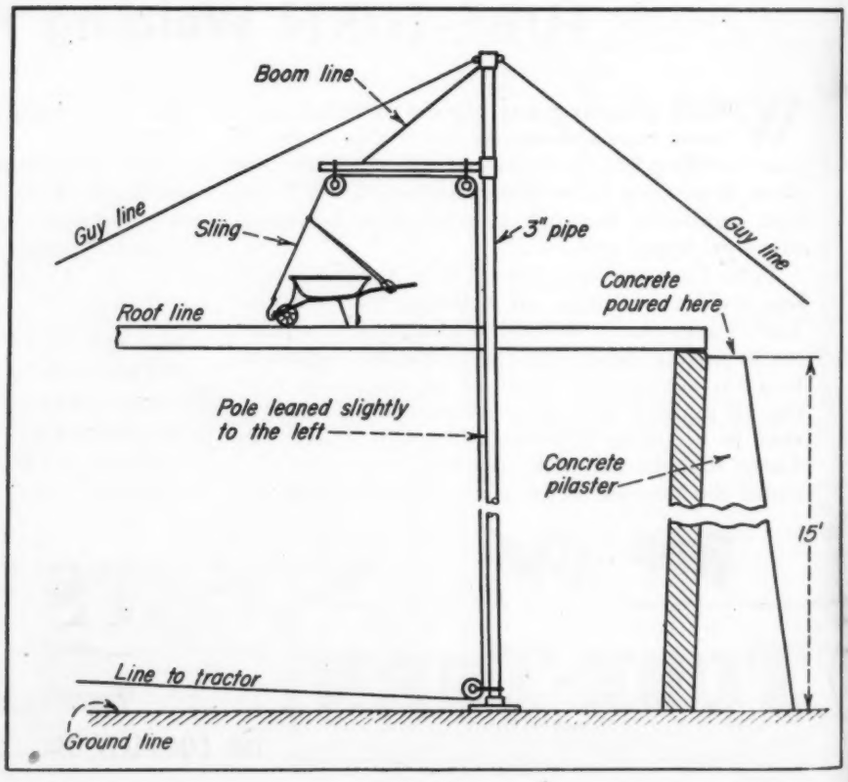
Since there was enough rope and other parts at hand, including a small tractor for power, it was decided to build a gin pole for hoisting the concrete and use ordinary wheelbarrows as containers.

A piece of 3-in. pipe was made to serve as a gin pole. It was rigged with a short boom at the top, so that when hoisted the barrows could clear the pole at all points. This pole was then placed close to the edge of the roof and guyed so that it leaned slightly to the left, as shown in the sketch. Putting the pole in this position made the boom, which was free, always tend to hang at the point where most of the hoisting was done.

The pole was rigged in the manner shown, with a single or whip line reeved through pulleys to keep the rope out of the way of the loads. A sling with three ends or strands was attached to the upper end of the rope. One strand of the sling carried a hook to engage the wheel of the barrow, while the other two strands were rigged with rings to slip over the barrow handles.

The concrete was bought ready mixed and delivered by mixer trucks. A penalty was charged if these trucks were not unloaded within a certain time, so there was plenty of inducement for speed in handling the material.

In operation the tractor was attached to the line. When the rings of the sling had been slipped over the handles of a loaded wheelbarrow and the hook caught in the wheel, the tractor started off. The ground man steadied the barrow as it went up, to eliminate swinging. When the wheelbarrow rose above the roof, another man swung it and the boom in over the roof, and the tractor backed up enough to set the wheelbarrow on the landing stage. This wheelbarrow was then unhooked and taken over to a hopper and dumped, while the roof man attached the hook only to an empty one. It was lowered to the ground by backing the tractor.



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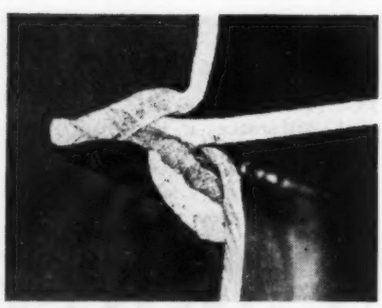
Causes of Defects When Welding Stainless Steels

IN THE FOLLOWING TABLE there are given some of the defects commonly found in stainless steel parts welded by the metallic arc and gas methods, with the usual causes of these defects. This analysis of welding defects and their causes refers primarily to those encountered in the welding of 18-8 stainless steels.

Defects in Metallic Arc Welding

DEFECT	CAUSE
1. Burn-through (Defined as penetration exceeding 100 percent. Usually associated with lap welding)	1. Variation of welding speed to compensate for excessive gaps in poorly fitted parts 2. Voltage and amperage too high for thickness of metal 3. Welding speed too slow, or erratic (fast and slow) 4. Angle at which electrode is held may be contributory cause 5. Use of extreme heat setting in tacking
2. Overlap (Often called cold weld. Characterized by lack of fusion between weld and parent metal)	1. Too low voltage or amperage 2. Too fast travel of electrode 3. Flux on tack welds 4. Excessive scale on parts 5. Flux from electrodes getting ahead of weld metal deposit 6. Peculiar flux action caused by incorrect angle of electrode 7. Large cold tacks that do not fuse with the finish weld
3. Skips or omissions	1. Improper positioning of work 2. Flux from tacks 3. Flux balling up during welding 4. Erratic speed of electrode travel 5. Poorly fitted parts 6. Defective spot weld tacking 7. Lack of care inside 90-deg. corners 8. Poorly fluxed electrodes, causing wild or unstable arc 9. Welder disturbed by noises 10. Helmet lens too dark to give good vision of weld puddle
4. Cracks	1. Excessive cold work after welding 2. Extremes in light and heavy gage combinations, causing shrinkage stresses 3. Incorrect welding procedure 4. Shear or tension loadings when weld area is at hot short temperature (1200 to 1600 deg. F.)
5. Undercuts (Weld metal deposit leaves a notch on one or both sides of weld bead)	1. Excessive heat, makes weld and parent metal too fluid 2. Rate of electrode travel too fast 3. Angle of electrode causes concentration of heat on one plate 4. Improper position of work. (Fluid weld metal flows from one plate)
6. Flux pockets and inclusions	1. Parts are not clean 2. Too low welding heat 3. Trapping of flux in large, misshapen tacks 4. Electrode directs arc ahead of weld deposit
7. Poor starts and endings (Large deposits at the start and insufficient weld metal at the end)	1. Carelessness. (Select proper heat range; use voltage control rheostat for starting and ending weld; position work properly)
8. Excessive weld deposits	1. Insufficient heat to fuse weld to parent metal 2. Attempts to repair a burned hole or other defects

Crack caused by too rich flame depositing carbon in weld metal



Poor fusion, weld and parent metal, in a two-pass arc weld

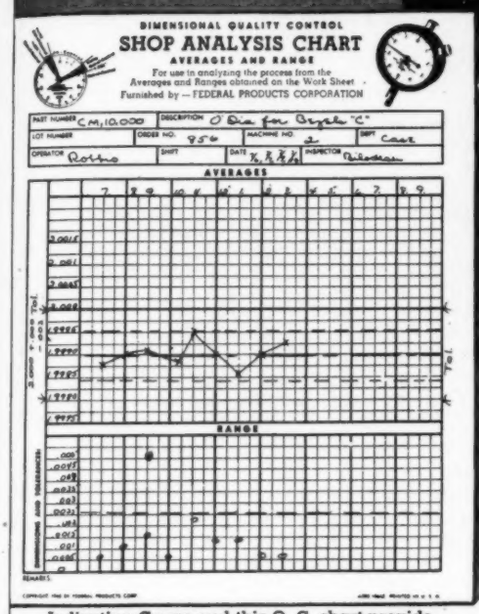
Porosity in this gas flame seam weld, due to poor technique

(Continued on page 170)

Prepared by FREDERICK S. DEVER, Spot Welding Supervisor, Ryan Aeronautical Co., San Diego

DIMENSIONAL QUALITY CONTROL

Dimensional quality is controlled directly at the machine.


DIMENSIONAL QUALITY CONTROL
SHOP ANALYSIS CHART
AVERAGES AND RANGE
For use in analyzing the process from the Averages and Ranges obtained on the Work Sheet
Furnished by — FEDERAL PRODUCTS CORPORATION
AVERAGES
RANGE

Indicating Gages and this Q. C. chart provide the data and means to keep dimensions under control.

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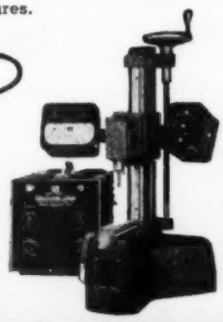

Economical Control at Production — a Management Tool

Federal Indicating Gages plus Quality Control Charts Make Graphic what is happening at the Machine

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A piece intrinsically difficult to turn, a dimension hard to maintain, and an out-of-round condition prohibited by assembly conditions. Rejects, rework and scrap ran high, unit hours low. Imperfections at this operation directly fostered inaccurate performance of the finished instrument.

After the introduction of Quality Control scrap figures dwindled by 75%. Even greater satisfaction was gained from the even flow of homogeneously dimensioned pieces coming from this operation.

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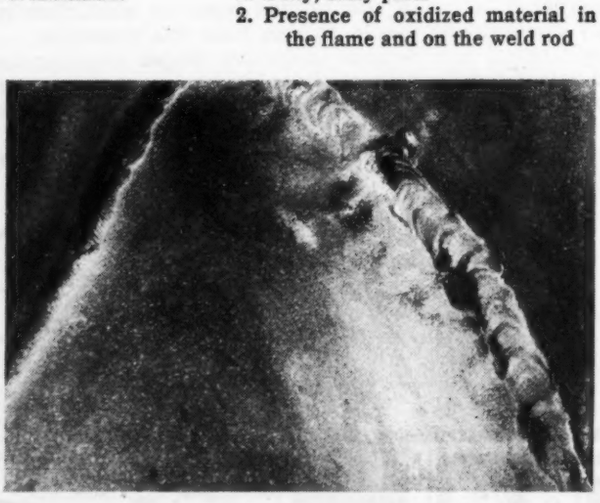
PRECISION MEASURING INSTRUMENTS

Causes of Defects When Welding Stainless Steels *(Continued from page 168)*

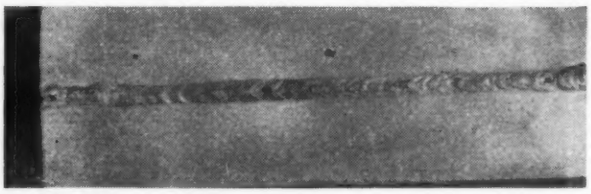
DEFECT	CAUSE
8. Excessive weld deposits (cont.)	3. Improper starting 4. Large, misshapen tack welds 5. Failure to clean work 6. Excessive weaving of electrode 7. Going back to cover an omission
9. Shallow weld deposits	1. Heat range too high, necessitating fast rate of electrode travel 2. Electrodes of too small diameter

Defects in Gas Welding

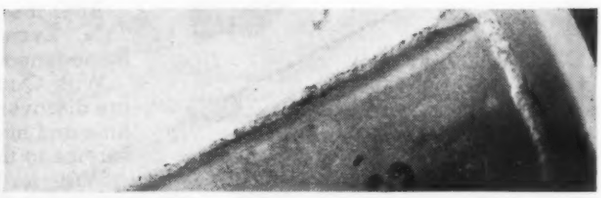
DEFECT	CAUSE
1. Excessive penetration	1. Excessive heat input 2. Too slow welding speed 3. Excessive width of weld 4. Attempts to produce a flat bead on weld surface
2. Insufficient penetration (Little or no reinforcing bead on under side of weld)	1. Too low heat input 2. Too great weld height 3. Too fast weld speed 4. Improper application of flux 5. Holding torch at too low an angle 6. Improper welding motion 7. Dirty, scaly metal
3. Undercuts (This defect parallels excessive penetration. Both are caused by the same conditions)	1. Too high heat input 2. Too slow welding speed 3. Insufficient flange or filler rod 4. Weld too wide 5. Poor welding technique
4. Porosity	1. Excessive puddling 2. Large flame and tip. and too fast travel
5. Cracks	1. Stresses set up by welding 2. Cold working after forming 3. Holding parts rigid by jigs or fixtures tends to cause cracks upon cooling
6. Inclusions	1. Dirty, scaly parts 2. Presence of oxidized material in the flame and on the weld rod
6. Inclusions (cont.)	3. Fluxed welding rod 4. Flux leaks into poorly fitted parts
7. Excessive width of weld	1. Poor welding technique 2. Poorly fitted parts
8. Inconsistency (Varied height and width of weld)	1. Poorly fitted parts 2. Incorrect rate of welding 3. Unevenly trimmed flanges 4. Improperly positioned parts 5. Part contour not properly aligned 6. Poorly tacked parts
9. Poor starts and endings (Burning away of parent metal on endings, lumps of weld metal at start)	1. Incorrect welding procedure



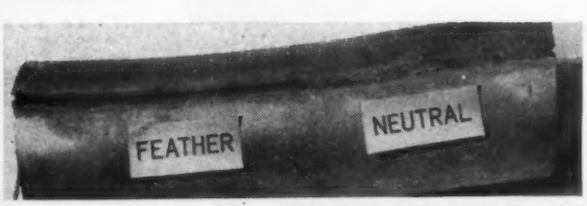
Rough seam weld caused by large, poorly made tack welds



Blowhole in seam weld, due to improper flame adjustment



Blowholes in gas-welded seam, caused by error in timing



Lowering of corrosion resistance of weld containing carbon, deposited by too rich feather flame. In acid pickle weld metal was dissolved. Weld made by neutral flame resisted acid

Photos courtesy Kalamazoo Vegetable Parchment Co.

This pH Control Equipment, on a food-wrapping-paper machine, is typical of many Micromax Controllers which help the food industry and its suppliers to maintain desired standards of taste, color, texture and economy. Controller is shown above, with its accessory flow-type pH electrode (1) and valve-driving mechanism (2) at right.

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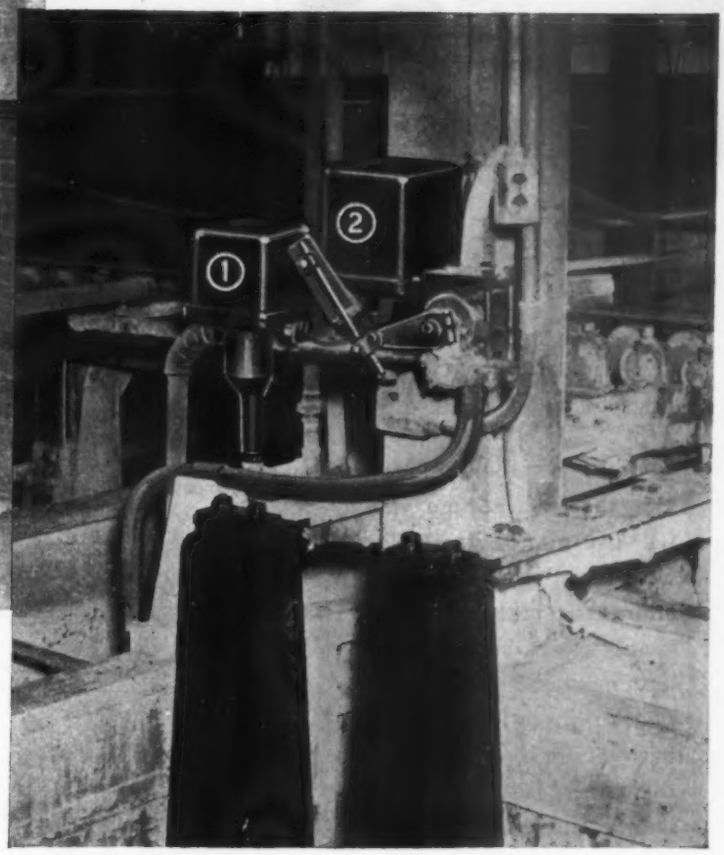

READY FOR pH CONTROL?

MICROMAX Provides It—Dependably!

In food processing . . . of milk, meats, grains and their products; of sugars, soups, vegetable stocks and juices, other foods . . . Micromax pH control can be a big factor in obtaining and maintaining high quality standards. With a Micromax instrument, an operator finds it easy to hold pH value, or change quickly from one to another.

The Micromax Controller bases its action on the pH of a small, continuous sample stream of food stock. This stream is by-passed through a flow-type glass electrode, which detects the pH and reports it to the Micromax Controller. The Controller measures the pH by balancing it against its self-contained standard. Simultaneously, and using the same balance principle, it compares the desired pH with that already measured. When Micromax thus discovers any difference between the two pH values, its valve changes the rate at which the pH-adjusting material is being fed. The change in rate persists until the pH of the process balances the desired value.

Because of the speed and micro-responsiveness of all elements of the equipment, the balance is seldom far "off" and is therefore restored almost instantly. The Controller automatically holds pH constant, regardless even of such factors as changes in the supply of processing stock.

An L&N engineer will be glad to send further information on request. If you have in mind a specific problem, please give its general outline.

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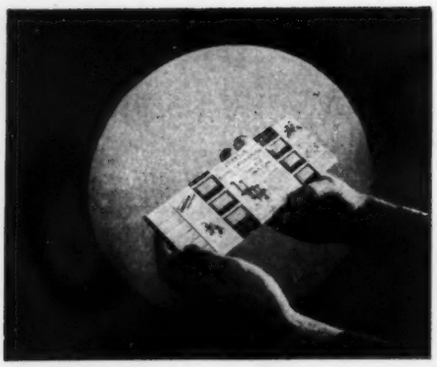

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● Here is an ingenious device that will enable you to tell at a glance if the sleeve bearings you require are standard stock items. You simply select the shaft size . . . then move the slide section to either right or left . . . and the correct combination of inside diameter, outside diameter, length and part number will appear.

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WHAT'S NEW IN EQUIPMENT

Brake Block

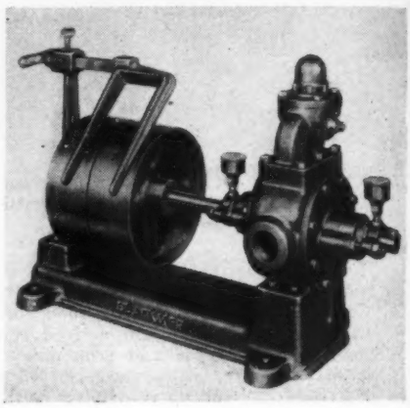
Type R-M Key-Lok brake block features lateral fishtail metal strips, or keepers, in which bolts are inserted, spaced to fit in the brake bands. Keepers slide into fishtail slots cut into the block. By this means the bolts, bands, or shoes need not be removed for relining. Keeper nuts are loosened, the old lining is slid off and the new one slipped on, bolts are tightened, and normal adjustments made, without permitting band to spring out of its proper radius. Advantages claimed for the brake block are that it eliminates deposits of foreign matter in bolt holes, prevents scoring, increases area of friction surface, improves holding ability of block to shoe, is adaptable to both internal and external applications, and reduces installation and maintenance costs. Raybestos-Manhattan Inc., Passaic, N. J.

Arc Welder

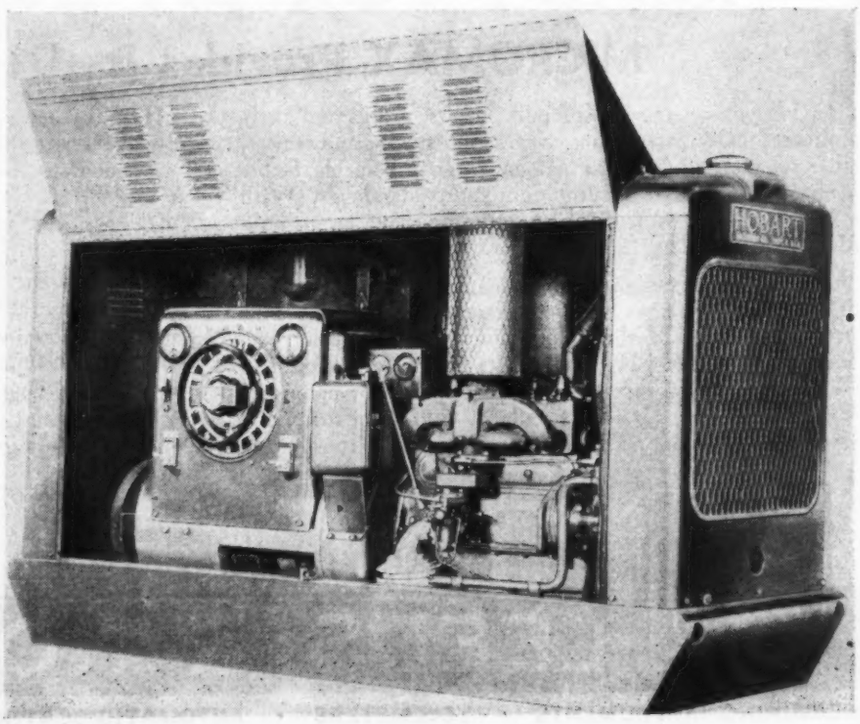
Lightweight simplified engine-driven arc welder has a range of from 40 to 275 amperes. Enclosed in a compact steel canopy with hinged side panels, it is powered with a 26-hp. 4-cyl. engine. Has multi-range dual control of welding current to adjust voltage and amperage relationship. With ten ranges of welding current, and 100 steps of volt-ampere adjustment in each range, the dual control makes available 1000 combinations of open circuit voltage and welding current for selecting arc characteristics, manufacturer states. Remote control allows volt-ampere adjuster to be removed from control panel for use with extension cord so that operator can adjust welding heat right at the work. Equipment includes automatic, mercury type idling device. Stationary model has steel skid mounting, beveled at both ends with tubular end cross members. Portable mountings on 2-wheel pneumatic-tired trailer, or on 16-in. shop type wheels also are available. The Hobart Bros. Co., Troy, Ohio.

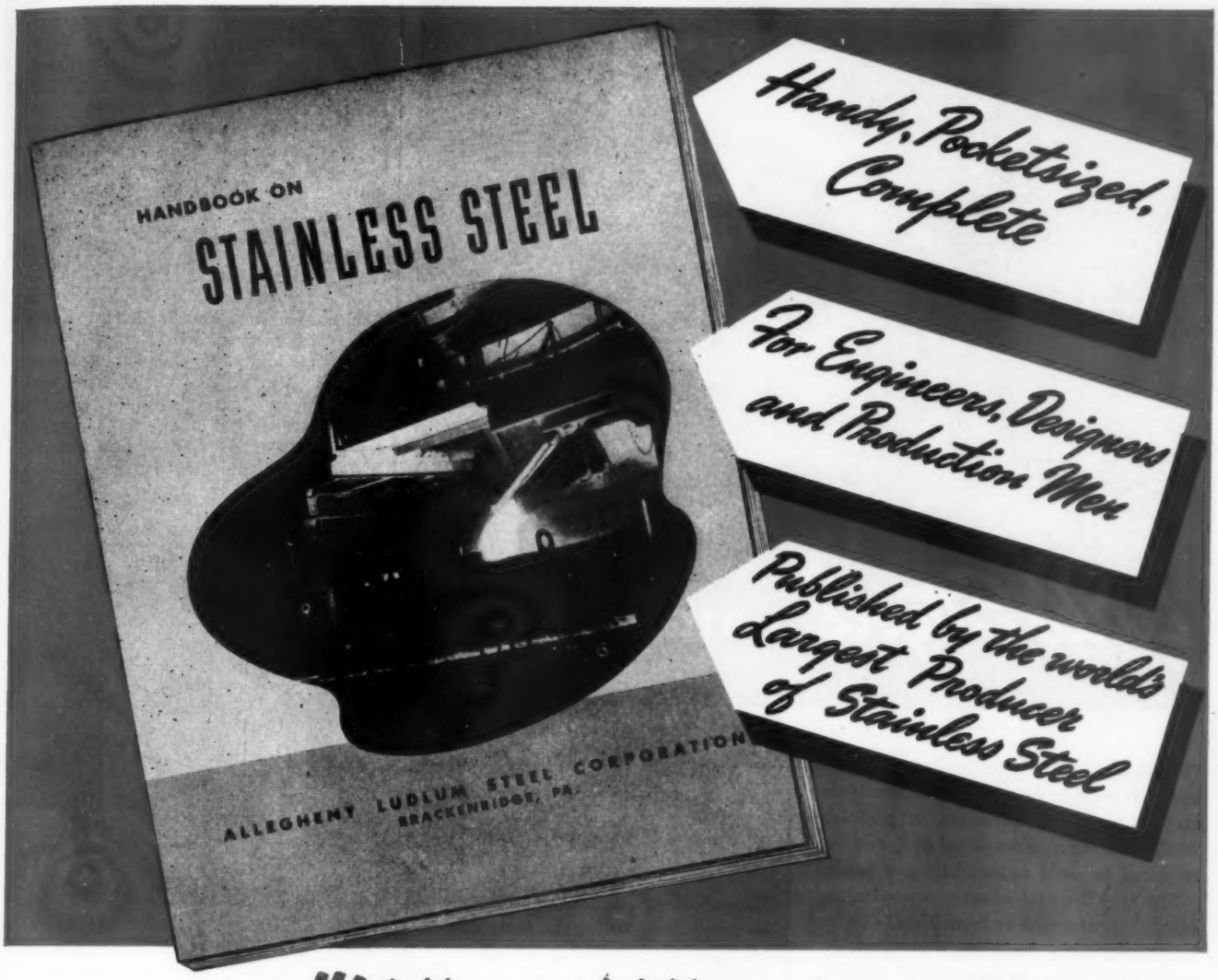
Rotary Pumps

A line of flat-belt, direct-motor drive rotary pumps, in capacities from 10 to 750 g.p.m. at pressures to 100 p.s.i., has been



adapted to filter and transfer applications. Designed to operate on the swinging vane principle, units are self-adjusting. The buckets (swinging vanes) move farther out

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of recesses of rotor as wear occurs at tips, maintaining normal capacity of pump until buckets are worn, and replaced. Same type of pump also is furnished with removable liners, enabling installation of liner and buckets without disturbing either piping or drive. Pumps are bracket-mounted on a common base, equipped with tight and loose pulleys, and belt shifter, or with motor. Standard relief valves are optional. Blackmer Pump Co., Grand Rapids, Mich.

Battery Charger

Function of unit known as Fast Battery Supercharger is to deliver direct current of the required rating for charging storage batteries, in a vehicle or elsewhere, without removing. Maximum time required is said to average 20 minutes. Charger detects and registers shorted and defective batteries, and sulphated batteries, provides

for elimination of sulphation. Has no delicate or complex parts, and few moving parts. Overload circuit breakers are on a.c. and d.c. lines. Conversion from a.c. source to d.c. for charging is obtained by Selenium rectifier. Unit is portable, mounted on large wheels with rubber treads, and weighs 130 pounds. Ten-foot d.c. leads and 20-ft. a.c. cords permit access to the available power supply. Two superchargers are available, one to operate from 100-volt, 60-cycle a.c.; the other from 220-volt, 60-cycle a.c. Benwood-linze Co., 1830A Locust St., St. Louis 2

Magnifying Scale

Rule, known as Micro Scale, features lens for magnifying scale markings. Includes 32nd, 64th, and 100th divisions, as well as decimal equivalents on reverse side, and height-depth indicator. Rule is of 6-in. stainless steel, has fiber case, and lies flat in pocket. Suitable for laying out tools and dies, measuring piece parts, checking tools, as a simple magnifier on fine drawings, to inspect textiles, and for other uses. Leonard Engineering Co., Silver Spring, Md.

Induction Heating Coil

Master coil, with removable inserts, is said practically to eliminate the problems of coil changing in setting up Thermonic

STRIP ACT PAYS OFF

And pays off handsomely too . . . for example look at the power drives on this machine. They incorporate a motor, a gear reduction unit and an electric brake (for quick, controlled stopping) with the entire unit flange mounted to the machine. All of these . . the motor, the gear reduction, the electric brake and the flange mounting . . . all are standard Master units that easily combine into one compact, integral power-package. This integral construction permits many parts to be stripped away from both the power unit and the completed machine and pays off handsomely in savings in material . . savings in space.

See how the designer of this machine has used these integrally built Master units to secure power right where he needs it . . . and at exactly the right speed. How else could he have achieved such a compact, clean-cut, economical design?

Probably you will not need exactly this same combination of motor features, but Master motors are available in any size from 100 down to 1/10 horsepower and in all cycles, phases, and frequencies . . . in open, splash-proof, fan-cooled, and explosion-proof types . . with Gearheads, Speedrangers and Unibrakes . . . for every type mounting . . . and over a gear reduction range up to 432 to 1.

Next time you need motors for your plant or your product, investigate Master's universal ability to supply an integrally built power drive that is just right for the job.

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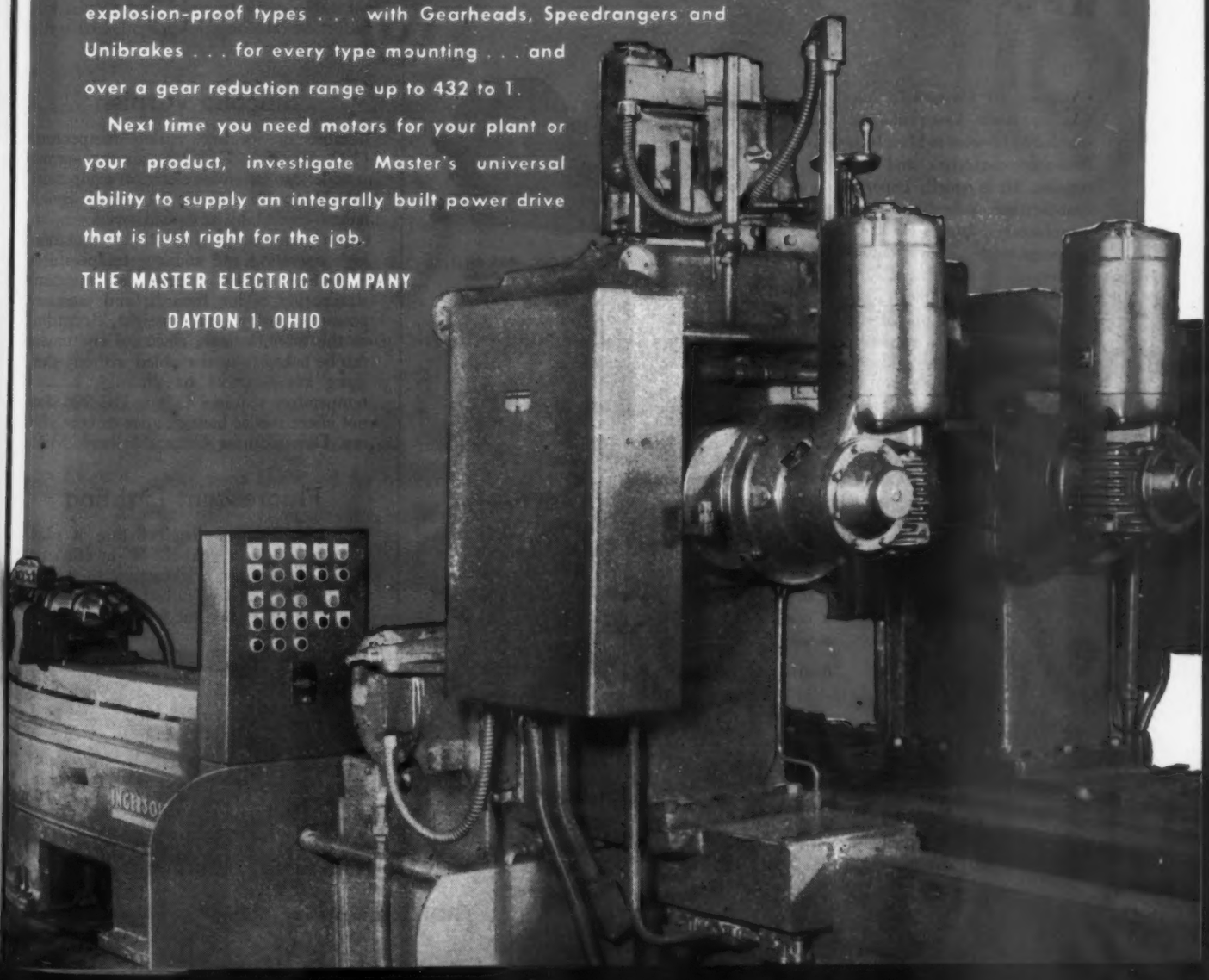

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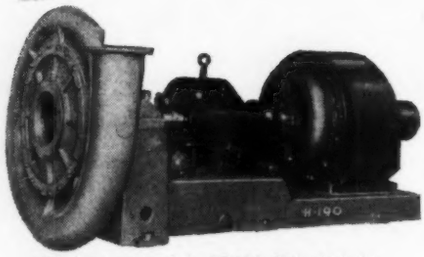

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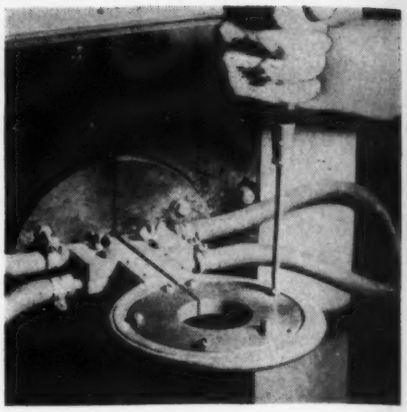


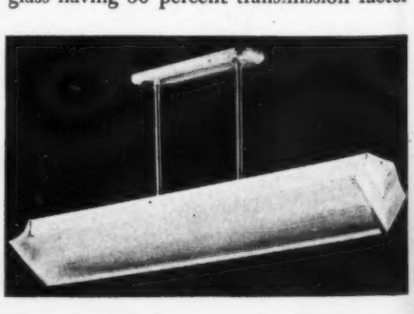
equipment for induction heating applications. Basic master coil consists of water-cooled inductor block, machined to take inserts which make up the actual coil. Used with a Thermonic output transformer, it gives, in effect, a single-turn inductor block of variable inside diameters. Inserts can be of any desired thickness, and are held in place by screws. When installed, they obtain their cooling by thermal conduction from master coil. Inserts may be used in multiples, providing flexibility of coils of varying contour. Standard set consists of two master coils and 48 inserts, accommodating diameters ranging from $\frac{1}{8}$ to 3 inches, of $\frac{1}{8}$-, $\frac{1}{4}$-, and $\frac{1}{2}$-in. thicknesses. Blank inserts are available to cut out contour to match a particular job. Induction Heating Corp., 389 Lafayette St., New York.

Silicone Varnish

Because of its low curing temperature (300 deg. F.), DC 996 silicone varnish provides insulation for electrical equipment. Advantages claimed are protection against failure caused by sustained overloads; increased service life of electrical insulation; high operating and ambient temperatures; protection against excessive moisture; elimination of fire hazards; and increased power output per unit weight. According to the manufacturer, electrical equipment can be baked fully assembled without damaging commutators or sliprings, because temperature required to cure DC 996 does not affect shellac-bonded mica or core plating. Dow Corning Corp., Midland, Mich.

Fluorescent Lighting

Glass-shielded fluorescent fixture is made for four 40-watt tubes. High efficiency with low intrinsic brightness is said to be effected by panels of ribbed ceramic coated glass having 80 percent transmission factor



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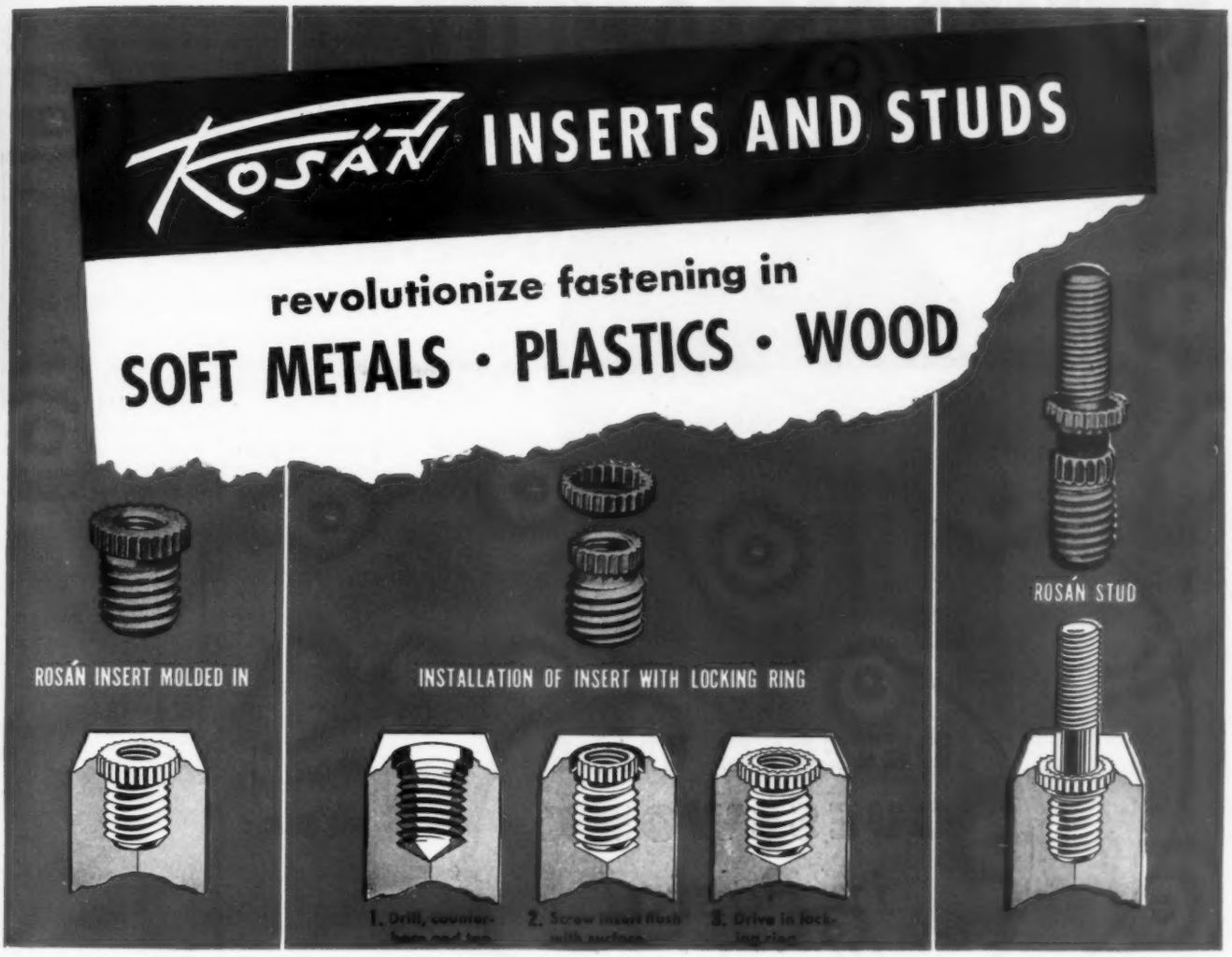

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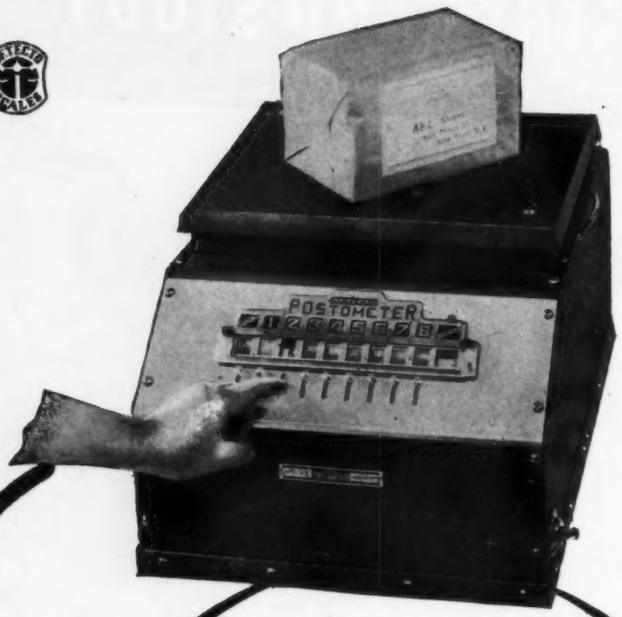

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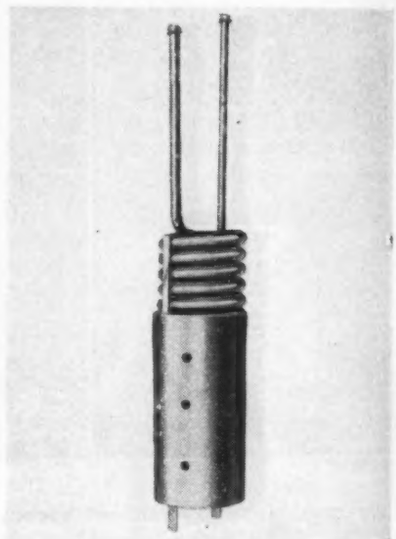
and diffusing qualities. Panels are removable for cleaning and servicing lamps. Fixture also features a simplified mounting plate for stem or flush-to-ceiling mounting. It can be used without glass shield, as well. Instalite, providing instantaneous starting, and eliminating starters, is optional. Glass shielded model is designated as CVG-448, and unshielded is CV-448. The Spero Electric Corp., 18222 Lanken Ave., Cleveland 19.

Bulk Tank Preheater

Preheating heavy liquids in bulk storage is the function of assembly now on the market. It can be made to fit tanks of any size which have a manhole 16½ inches or larger, and is installed by cutting or drilling holes for pipes in manhole of tank. Provides 38 square feet of direct radiation surface, plus 10 square feet of secondary



shell heating surface. Unit has a flow accumulator which directs liquids over heating coils before entering suction line. Built for use with steam or hot water. Coil is 1¼-in. standard steel pipe, shell is 12-gage sheet steel with 16-in. o.d., and accumulator is steel construction bolted in place. Rempe Co., 342 North Sacramento Blvd., Chicago 12.

Luminous Button

Utilizing radium, safety-marking button gives off a constantly glowing electrical emanation without need for recharging or activation by light. Its use for identification of passages, exits, stairways, gas and water valves, electrical switches, hazards, and danger points prevents accidents when lights go out in emergencies. Called Radi-Glo button, it is a ½-in. ring of clear plastic. Sealed channel in ring is coated with a minute and, maker states, harmless charge of radium which has been compounded with other ingredients to make a paint. Ring can be attached to almost any surface. Can be sewed on fabrics, or threaded directly on cords and wires, while gas, steam, and electrical conduits can be marked by tying or taping the rings around pipes. A button in each corner of

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When the Factory says "No" ...We Say "YES!"

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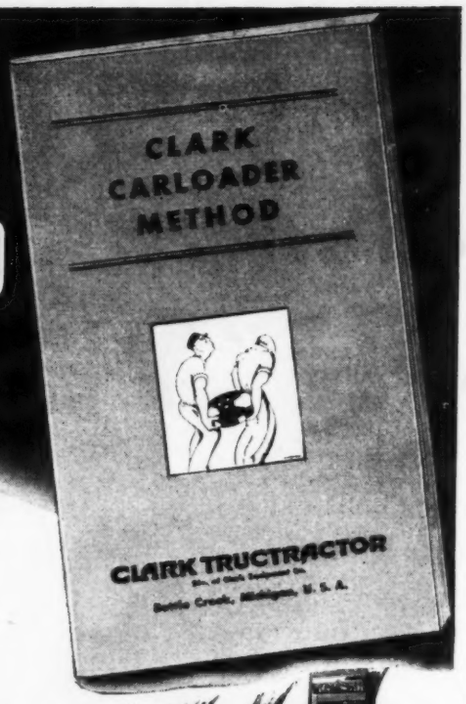

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first aid kit cover makes it visible in the dark. Telephone, flashlight, and light switch can be fitted with the spotter buttons, and warning signs can be made with them. Lustrolite Cleveland Corp., Cleveland.

Electronic Timer

Interval timing is the function of electronic timer which provides interval control from 1/25 to 80 seconds. Employs two vacuum tubes, is said to be easy to set, and to be foolproof. Timer is controlled by a pushbutton. No resetting is required between

operational cycles. Set for a given interval, it repeats that time cycle each time pushbutton is operated. Once initiated, time cycle is independent of pushbutton. Caltron Co., 11744 West Pico Blvd., Los Angeles 34.

Corrosion-Resistant Coatings

When applied to a porous surface—metals, wood, concrete, or similar—Alkacite coatings are said to penetrate surface, blocking off moisture, acid reaction, retarding corrosion, rotting, and disintegration of the structural material. A film 0.001-inch thick, applied to metals resists hydrostatic pressures exceeding 100 p.s.i. for months, and surface penetration of Alkacite resists corrosion after the film has been scraped from the metal, maker claims. Formulas for different industrial needs include Type 101, a high-solid sprayable base, prime, or finish coat for structural steel; Type 102, a heavier formula for brushing; a brushing mastic applicable to tank linings for water, acid, and alkali solutions; and Type 103,

. . . you will want copies of these books!

Bulletin UPA for the first time gives engineering data on a newly developed approach to power transmission. In this bulletin are shown compact Power Units. These "packages of power" assure absolutely correct mounting of gears, so essential to efficient operation, particularly when the gears are of high precision. Their design incorporates "A-Q" gears, described below.

Bulletin AQA gives complete engineering information on the design and application of "A-Q" (aircraft quality) gears. These new gears assure greater mechanical efficiency, longer life, lighter weight, more compact design and quieter operation.

These gears embody advance techniques in design and manufacture that permit operation at higher speeds and make possible loadings far in excess of values customarily considered safe design. By incorporating them in the machines you manufacture, your engineers may be able to solve difficult problems now confronting them—may be able to improve the performance of these machines and may be able to reduce over-all costs.

These books should be in the hands of every designing engineer or manufacturer interested in equipment requiring the transmission of power. Check the coupon and mail it today.

FOOTE BROS. GEAR AND MACHINE CORPORATION • 5225 South Western Blvd., Chicago 9, Ill.

FOOTE BROS.

Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
Dept. I, 5225 S. Western Blvd.
Chicago 9, Ill.

Gentlemen:
Please send me Bulletins checked below.

☐ Bulletin UPA on Foote Bros. Power Units
☐ Bulletin AQA on Aircraft Quality Gears

Name.....

Position.....

Firm.....

Address.....

City.....*State*.....

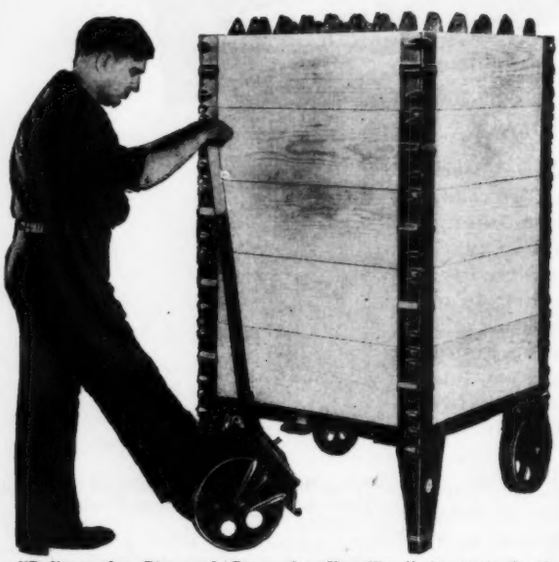
Bin Sections on Turner Transports loaded with battery parts, ready for instant removal to production lines as required.

"NONE ARE SO BLIND AS THOSE WHO WILL NOT SEE!"

It will pay you to look into the

TURNER SYSTEM
OF MATERIALS HANDLING

Hundreds of manufacturers are now using the TURNER SYSTEM OF MATERIALS HANDLING to cut labor cost, save floor space, speed handling. The Turner System will show you how to do these things in your own plant, but more than that, it will provide the MEANS to do them perfectly. A perusal of this system will open your eyes to new profit possibilities in spite of today's handicaps.



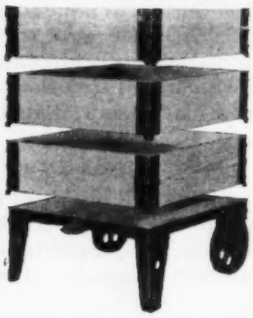
"Deliver the Bin and Save the Handling" is typical of TURNER SYSTEM savings. Here one man does the work of several, and keeps materials properly stored in bins at the same time. Loads are moved with the hand "Jimmy" or any modern power equipment.

SEND FOR THE TURNER SYSTEM BOOK

A complete outline of the Turner System is presented in a twenty-page book sent without charge to established companies. Write on your letterhead for your copy.

60 DAYS FREE TRIAL IN YOUR OWN PLANT

In order that you may see for yourself how your plant can benefit from the use of this system we are willing to ship an assortment of standard units for 60 DAYS FREE TRIAL. Use them for at least two months. Keep them if (in your opinion) they save labor, time and space. Return them if they don't. There is no obligation except that you assume nominal transportation charges.



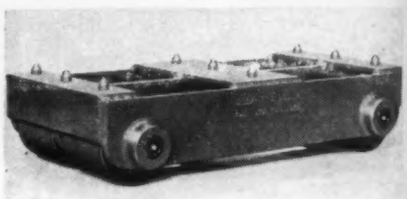
Bin Sections, either wood or steel, are removed as load diminishes, added as load increases. Always the right size bin.

FACTORY SERVICE COMPANY
4605 N. TWENTY-FIRST ST. MILWAUKEE 9, WISCONSIN

an aluminum coating. They may be applied to damp surfaces; will not craze, crack, loosen, or scale; meet standard tests for resistance to moisture, weathering, acid and alkali penetration and deterioration; and resist vibration, distortion, and bend tests, according to the manufacturer. Protective Coatings Inc., Box 56 Strathmoor Sta., Detroit 27.

Dollies

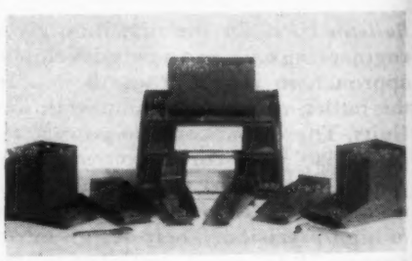
Obtainable in pairs, Skid-Rol dollies are for shifting machines, tanks, boxes, steel blocks, dies, furnaces, heavy objects, and similar 10- to 12-ton loads. Steel cleats imbeded in wood skids carry the load a few inches from floor. Claimed to reduce personal injury, and to avoid accidents



caused by passing and positioning rollers. By manual power, load can be rolled from place to place over hard floors or pavements, and diagonally across railroad tracks. Each dolly is 18½x10½x4 inches high, and is equipped with 4 all-steel rollers 3¾ inches in diameter. Roller bearings are lubricated through Zerk fittings. Techtmann Industries, Inc., 828 North Broadway, Milwaukee 2.

Bench Bins

Standard bench bins are designed for use directly on bench or in racks. The bins have a forward tilt for gravity feed of parts, and the back, which raises the bin, is said to give additional support. Folded edges at



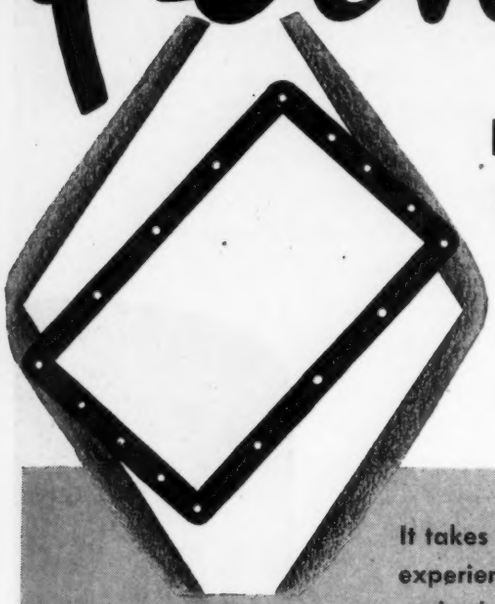
front prevent injury from sharp edges. All-metal construction, finished in olive green. Bins range in width from 2 to 8 inches, and in capacity from ½ to 2 pints. The Gordon L. Hall Co., Old Lyme, Conn.

Ventilating Duct

Portovent is a metal-reinforced lightweight large-diameter duct, which can be compressed into small space for transportation. It is suited for use with portable manhole and tank ventilators, as well as with portable air conditioning, heating, and cooling units. Has sectional construction, allowing assembly of any length from 2½-ft. sections. Can be coupled and uncoupled by hand, and forms tight joints, which cannot be

Bunting manufactures not only Special Bearings to your specification but Standard Stock Bearings and Precision Bronze Bars. On Special Bearings our engineers will be glad to work direct with you. Standard Stock Bearings and Precision Bronze Bars are available from your nearest Authorized Bunting Distributor. The Bunting Brass & Bronze Company, Toledo 9, Ohio.
28
Bunting
BRONZE BEARINGS ☆ BUSHINGS ☆ PRECISION BRONZE BARS

Perhaps



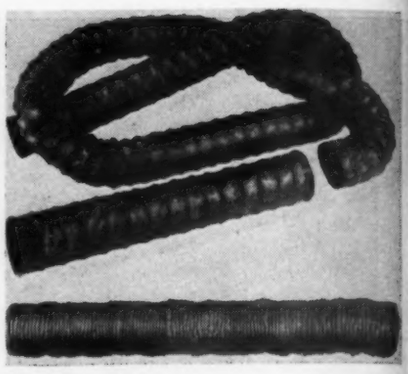
IT'S GASKETS OR INTRICATE RUBBER PARTS YOU NEED?

It takes specialized engineering experience to know how, when and where to put rubber parts to work advantageously. Johnson engineers with years of practical experience have created, designed and put to work many intricate rubber parts that were the answers to manufacturers' problems in various fields.

Your particular problem may only be a gasket of some sort or a new source of supply on a rubber part. Regardless of whether yours is a complicated or a simple problem we welcome the opportunity of working on it. We have in our modern plant the equipment and facilities for producing rubber parts of all description, molded or extruded in any quantity. Let us have your problem, you'll find we are easy to do business with and anxious to serve.

Johnson
RUBBER
COMPANY

MIDDLEFIELD, OHIO



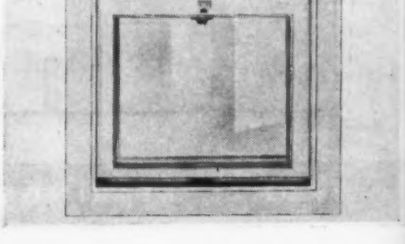
broken by jerks or pulls encountered in service, maker states. Attachments for coupling to blowers or other air handling apparatus are provided. Reinforcing rings, spaced 2 to 5 inches apart and varying according to diameter of hose, are held in place by Neoprene base compound, which also covers inside and outside surface of hose. Made in sizes from 5 to 24 inches in diameter. American Ventilating Hose Co., 15 Park Row, New York 7.

Oil Gages

Line of oil gages features unbreakable plastic sight supported by a heavy central stem and top cap. This is said to eliminate need for protective shell that might obstruct visibility. Assembly is locked with an independent nut compressing cork gasket, and preventing leakage. Gages can be taken apart for cleaning, and can be installed where there is insufficient room for a one-piece gage. Standard sizes range from 1¼ to 5 inches, and sight diameter from ½ to 1 inch, with stock threads of ⅛-, ¼-, ⅜-, and ½-in. N.P.T. Special height and length gages can be furnished, and gages are available with drain plugs, or straight gages for applications where elbow type is unsuitable. Oil-Rite Corp., 3479 South 13th St., Milwaukee 7.

Metal Window

Utilizing rust-proof bonderized metal, all-metal window incorporates storage of the lower storm sash within the unit itself. It is a permanent single combination assembly providing screen, storm sash, and weather-stripping. Spring-steel clip arrangement permits the lower storm sash to be raised and



learned better...faster...at the movies

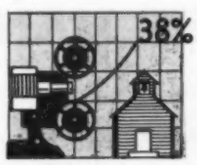
INDUSTRY thinks of "movies" in terms of the intelligently planned training films which so rapidly swung peacetime workers into war production lines... successfully shifted employees from one type of work to another as military needs called for different weapons... and now has undertaken the task of training personnel to the needs of reconversion.

Authorities state: "Industrial training time was cut 25% to 30% . . . Army training time was reduced as much as 40% by the use of movies."

Vivid and easily understood, motion pictures and slide films give step-by-step demonstrations of industrial technics . . . actually *show* the workers *how, why, where, and what* . . .

Objectives of teaching with training films are as wide as you wish—full use is still being explored—and it's better instruction, without favoritism or other personal elements.

Most significant of all—tests prove that movie-taught groups retain 38% more of the information imparted...38% more than was retained by group taught in ordinary ways.



Training films are the quickest, most efficient way of teaching any subject, abstract or specific. Use them to teach new operational methods . . . changes in old procedures . . . phases of safety and health . . . leadership . . . objectives of management.

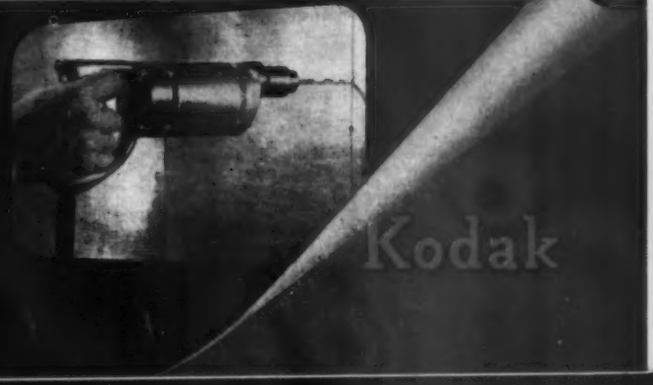
Remember, your commercial producer is a specialist in such films . . . and can help you organize your planning, writing, and creative work *now*.

Also available—at low cost and often free—is a wide variety of training films made by private industries, the Office of Education, Washington, D. C., as well as those offered by non-theatrical film distributors in key cities. For further information on these sources, write today to:

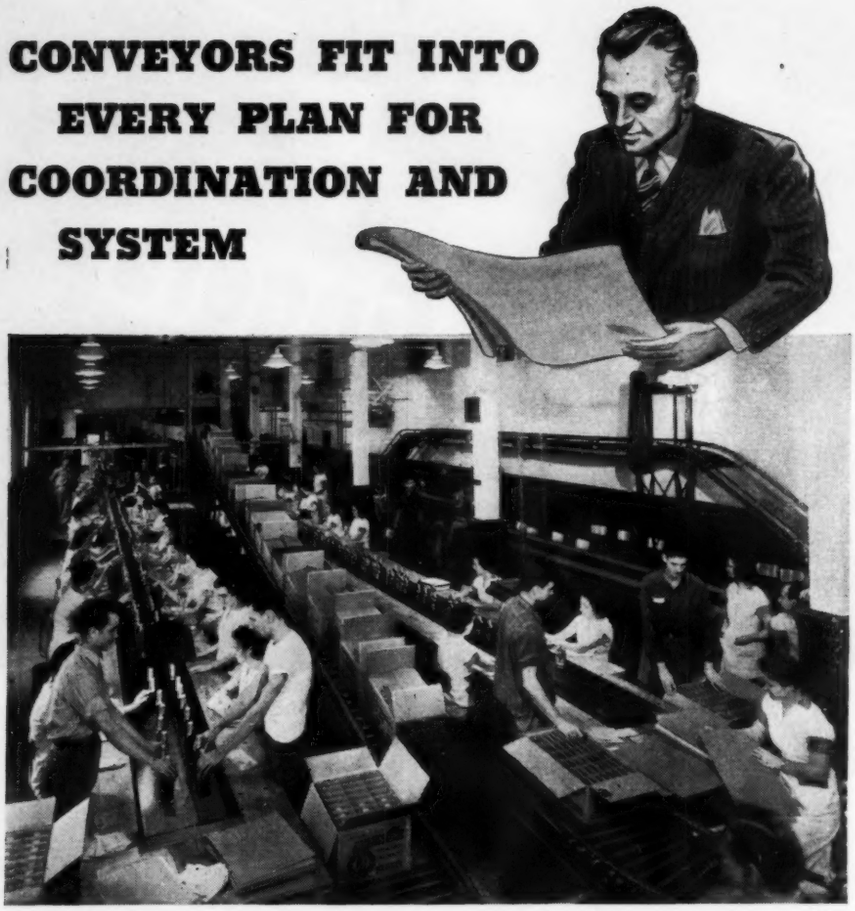
EASTMAN KODAK COMPANY
Rochester 4, N. Y.

TRAINING FILMS
teach "know how" by "show how"

faster instruction... at lower cost
... uniform... and more lasting



CONVEYORS FIT INTO EVERY PLAN FOR COORDINATION AND SYSTEM



...WITH THE *Plus* OF *FAST* LOW-COST HANDLING

Conveyors are an important weapon in your war on waste and inefficiency. They contribute substantially to the elimination of disorder and confusion—congestion—working hazards.

When you plan for faster, better organized production — check your plan thoroughly on the score of conveying and conveyors.

Why not check with Standard Conveyor—builders of an unusually wide variety of conveying equipment including power and gravity conveyors in belt, roller, chain and slat types, spiral chutes, piling and lifting machines, pneumatic tube systems.

Whether commodities — boxes, cartons, parts, units, packages—have to be moved in a straight line, a curve, up, down, or across, there is Standard equipment to do the job, developed in more than 40 years of service to business and industry.

Write for valuable reference book "Conveyors by Standard," Catalog No. FM-115.

STANDARD CONVEYOR CO.

General Offices: North St. Paul 9, Minn.

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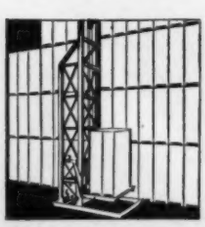


TIERING AND LIFTING MACHINES

PORTABLE PILERS

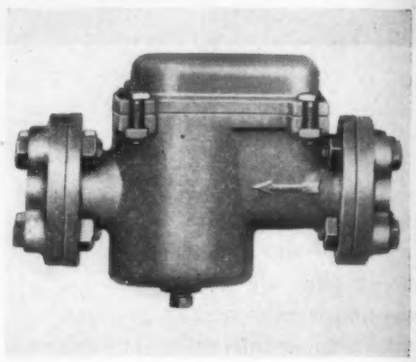
SPIRAL CHUTES

PNEUMATIC TUBE SYSTEMS

held in a storage space provided behind upper sash. Unit eliminates the seasonal work of taking down, putting up, storing, painting, and repairing screen and storm sash, and provides year-round rain-proof, draft-free ventilation, according to the manufacturer. The light screen and glass inserts can be removed for cleaning from inside, where adjustments also can be made. Device is said to control steaming and frosting of windows in winter, and to cut winter fuel costs, as well as to provide additional protection against entry by prowlers. The F. C. Russell Co., 1836 Euclid Ave., Cleveland 15.

Pump Strainer

Developed for protection of pumping equipment, the Low-Swing strainer has been added to line of Ezy-Kleen strainers. Unit is claimed to have the following advantages: (1) Use of perforated metal (steel, or bronze) instead of wire screen for basket helps prevent damage in clean-



ing; (2) slotted lugs of top plate, lined up with lugs of strainer body to receive the four holding bolts, allow quick removal of basket for cleaning; (3) compact build permits mounting in small space or in lines along walls; (4) strainer is designed for flange mounting, and companion flanges are included as a part of unit. It has a capacity of 100 g.p.m. with 2-in., 2½-in., and 3-in. intake and discharge sizes. Maximum operating temperature is 600-deg. F.; maximum pressure, 75 p.s.i. Blackmer Pump Co., Grand Rapids, Mich.

Change in Name

Corporate name of Detroit White Lead Works has been changed to Rogers Paint Products, Inc., There will be no change in personnel or organization.

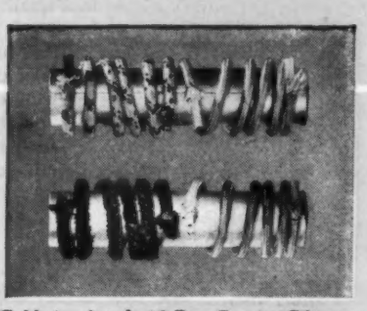
Combustibles Recorder-Controller

Automatic analyzer and recorder, for indicating, recording, and controlling combustibles content of a gaseous mixture, has been developed. The instrument can be applied to precision control of furnace atmospheres and chemical processes, as well as to combustibles measurements in petroleum, metallurgical, automotive, and chemical industries. Said to provide a continuous graphic analysis almost instantly, to be responsive to changes of 0.05 percent

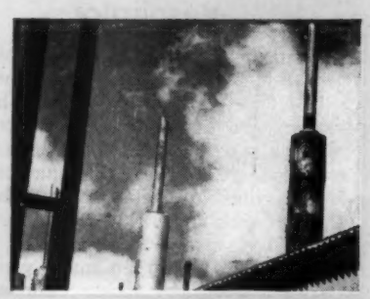
DOW CORNING

SILICONES

revise old concepts of the properties of materials



Cable insulated with Dow Corning Silicone rubber (at right) shows no change after one hour at 250° C., in contrast with organic rubber, which has melted and exuded freely through the braid.



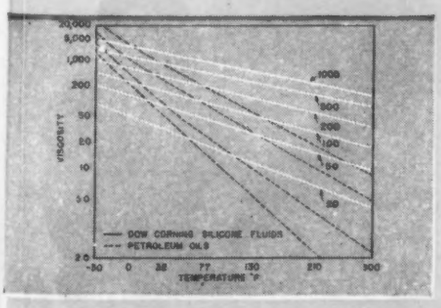
The excellent condition of the stack at left, protected with silicone based paint, indicates the ability of such finishes to withstand moisture, oxidation, ultra-violet rays and temperatures up to 500°F.

American industry has been quick to prove the outstanding advantages of Dow Corning Silicone products. The greater heat stability, inertness to water and chemicals, and the excellent dielectric properties of these high polymeric substances radically change old concepts of the properties of materials.

Among DC Silicone products commercially available are: Fluids notable for low rate of viscosity change over a wide temperature range; Lubricating Greases for service at temperatures down to —70°F. and up to 400°F.; special Stopcock and Plug Cock Greases; Varnishes and Resins for impregnating, coating and bonding, and for waterproofing asbestos, mica and Fiberglas cloth; Silastic*, a rubber-like silicone material for molding, coating, extruding and laminating.

Inquiries are invited.

*TRADE MARK, DOW CORNING CORPORATION



Here is graphic illustration of the fact that Dow Corning Silicone fluids undergo strikingly little change in fluidity over a wide range of temperatures.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

New York Office: Empire State Building

Dow Corning

FIRST IN SILICONES

K.O.'d by DUGAS in 37 Seconds !

● In a test conducted for the observation of Underwriters' Laboratories and Factory Mutual Laboratories, 500 gallons of 300 degree F. flash point paraffin oil were "touched off."

This "transil oil" fire was large (20 ft. x 20 ft. area). After burning for 2 minutes, a DUGAS 150-A Wheeled Extinguisher equipped with the *new dual-stream nozzle* was brought into action.

In a mere 37 seconds, the inferno was extinguished.

NEW NOZZLE STEPS UP EFFECTIVENESS

NEW DUAL-STREAM NOZZLE deals effectively with spill fires and fires difficult to reach because of height or obstructions. Designed for use with DUGAS Wheeled Extinguishers, the new Dual-Stream Nozzle greatly increases fire-fighting range and effectiveness. A turn of the handle gives a *straight* stream with a range of 45 feet—or a *fan* stream with a range of 15 feet.

QUICK FACTS ABOUT DUGAS DRY CHEMICAL

1. For extra-hazardous fires involving flammable gases, liquids, greases or electrical equipment.
2. Not an electrical conductor.
3. Non-toxic, non-corrosive, non-abrasive.
4. Not affected by extreme cold or heat.

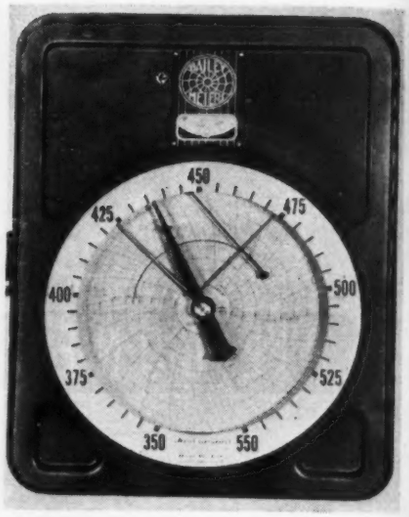
Write today for complete information regarding DUGAS Wheeled Extinguishers with the new Dual-Stream Nozzle . . . and DUGAS Hand Extinguishers.

AN ANSUL PRODUCT
duGas
THE MASTER OF FLAME

Approved by Underwriters' Laboratories, Factory Mutual Laboratories

DUGAS 150-A WHEELED EXTINGUISHER

ANSUL CHEMICAL COMPANY, MARINETTE, WISCONSIN
DUGAS DIVISION



combustibles, and to sustain accuracy within 0.25 percent. Variable fuel quality does not affect the accuracy of control. Pneumatic control or electric alarm contacts may be provided on both 1- and 2-pen recorders. A 2-pen recorder utilizes separate analyzers so that the speed is not impaired by switching, and the two records are independent of each other. Bailey Meter Co., Cleveland 10.

Change in Name

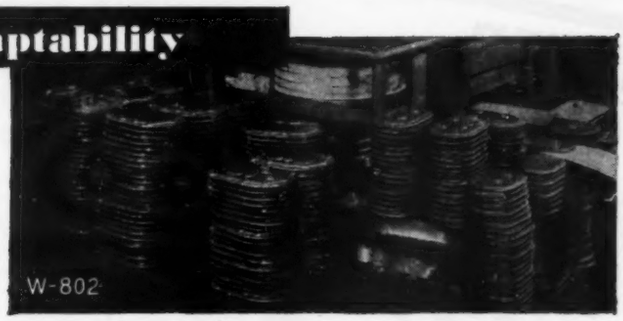
Florez, Inc., is the new name for Visual Training Corp., 815 Bates Street, Detroit. Its field of activities is "training men and women in industry."

Respirator

Breathing apparatus, called Air-Pak, for use with portable oxygen equipment is self-contained, and utilizes normal breathing air, which can be stored under pressure, in a compressed air cylinder. No chemicals are required. Has quick-connect feature, which permits wearer to breathe through open end of the low-pressure face mask hose until entering danger zone. Equipped with Willson mask, which includes shatterproof lenses cushioned in rubber, designed to allow unobstructed

FOR ADAPTABILITY PUT IT ON THE BLANCHARD

Adaptability

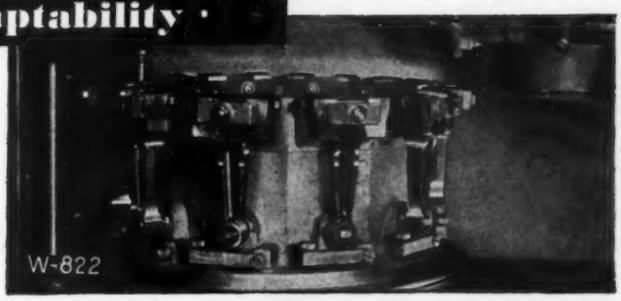


This picture clearly demonstrates the adaptability of the Blanchard. Here are a variety of pieces of cast iron, steel, and bronze ready to be ground on the No. 18 Blanchard Surface Grinder. Most of the pieces are to be ground on two sides, the usual limits being ±.0005" and the amount of stock removed from .015" to .020" per surface.

Adaptability

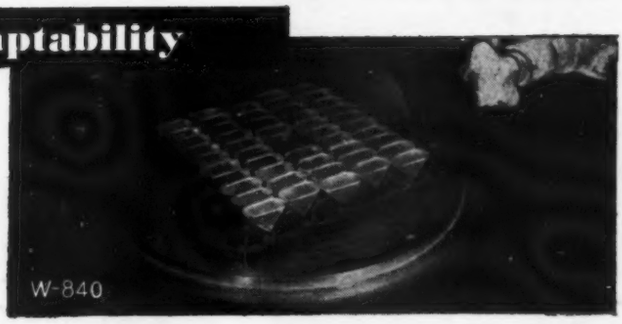
In adapting this work to the grinder, a Blanchard designed fixture holds ten pieces on the chuck at one time. These housing poles for magnetos have .140" stock to remove from steel laminations, and 30 pieces are finished per hour. This job also demonstrates Blanchard's ability to carry through from roughing to finishing operation.

Adaptability



This is an excellent example of increased production through adaptability. Formerly these master rods for an 1830 H.P. radial engine were milled and finish-ground one at a time at the rate of 15 to 20 minutes each. Now they are ground 10 at a time in a Blanchard special fixture on the No. 18 Blanchard Surface Grinder, which removes 3/8" of metal and turns them out finished at the rate of four minutes each.

Adaptability



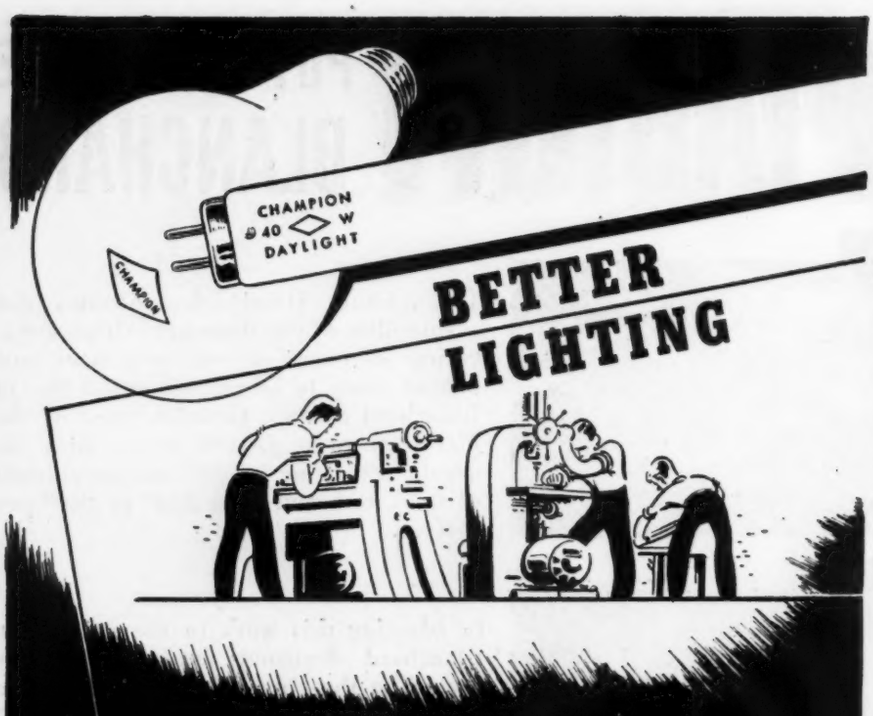
The versatility of a Blanchard Grinder is well demonstrated in the adaptability of Blanchard No. 11 Surface Grinder. The illustration directly opposite shows a special fixture load of 48 glass prisms ready for grinding the hypotenuse. The "V" block fixture is held magnetically on the chuck. Grinding time is less than 3 minutes and stock removal .085".

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.



Brings You Better Morale — Increased Production

Greater Use of Plant Facilities

Why not CHAMPION *Such a Good Cause?*

CHAMPION **Fluorescent** and *Incandescent* Lamps are designed, manufactured and tested to be worthy of the responsibility for better industrial lighting. When you put CHAMPIONS to work in the right places* all over your plant you get these four Champion "Diamond points" of value:

1. **Champion Quality**—guaranteed to equal or exceed Federal Specifications and backed by the engineering, production and quality control resources of one of the largest lamp producers in the industry, specializing in fine lamp manufacture for forty-five years.
2. **Champion Service***—trained lighting experts in the field to give you competent and unbiased counsel on correct lighting for every part of your plant.
3. **Champion Economy**—Champion Lamps are specially designed and distributed for industrial application. Their use helps to insure minimum lighting cost as well as lower lamp cost.
4. **Champion Distribution**—carefully developed through an industrial distributor near your plant, selected for his ability to meet your needs promptly and efficiently.

CHAMPION LAMP WORKS

Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO

vision. The fresh breathing air drawn into mask eliminates lens fogging, and exhalation valve prevents accumulation of gases inside mask. Integral with the demand-type regulator is a pressure gage showing amount of air remaining in compressed air cylinder at all times. Two types of compressed air cylinders are available—the back pack model and the sling type. Scott Aviation Corp., Lancaster, N. Y.

Fluorescent Lighting Ballasts

Ballasts for hot and cold cathode fluorescent lighting are claimed to feature close matching with tube characteristics, as well as end-blacking and premature burnout reduction. Quiet in operation, they are

suitable for installation where noise level is low. Two-way roll-turn lead-out is said to prevent strain on lead insulation, and to make wiring easy. It may be attached to exterior or interior channels. Adaptable to standard fixtures. American Transformer Co., 178 Emmet St., Newark, 5, N. J.

Door Mat

Rubber, friction, and resin composition door mat, known as Ameritred, measures $\frac{3}{16}$x18x30 inches. It is of heavy,wide-ribbed

construction and can be cleaned. Color is black. American Mat Corp., 1745 Adams St., Toledo 2.

Stock Checker's Truck

Incorporating a writing table and stationary rack, stock checker's truck is announced. Construction is all steel welded, with 3 sheet-steel shelves, which have a 1-in. flange

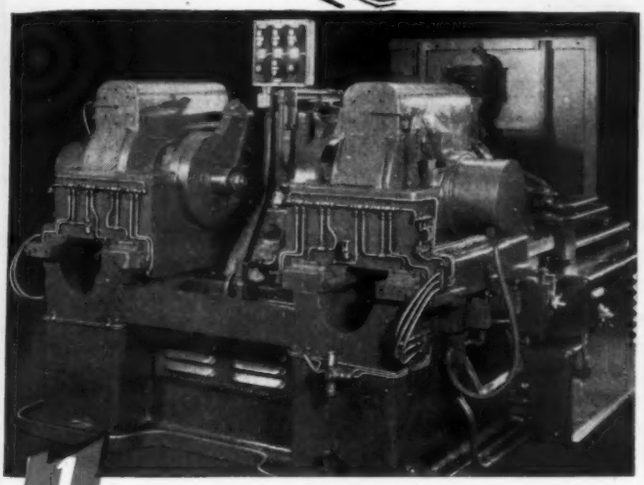
How to Add M. P. T.* to Your Machines

● Whether it's a case of meeting war production schedules *on time* or of preparing for peacetime production *in time*, you want the advantage of lower production costs. And one way to *get* that advantage is to add M. P. T.—*more productive time* per machine per day.

Alemite Centralized Lubrication Systems help add M. P. T. . . . because they not only assure *proper lubrication* but also permit machines to keep on producing *during lubrication.*

Thus, you add M. P. T. to your machines. Costs go *down* as production goes *up!*

**More Productive Time*

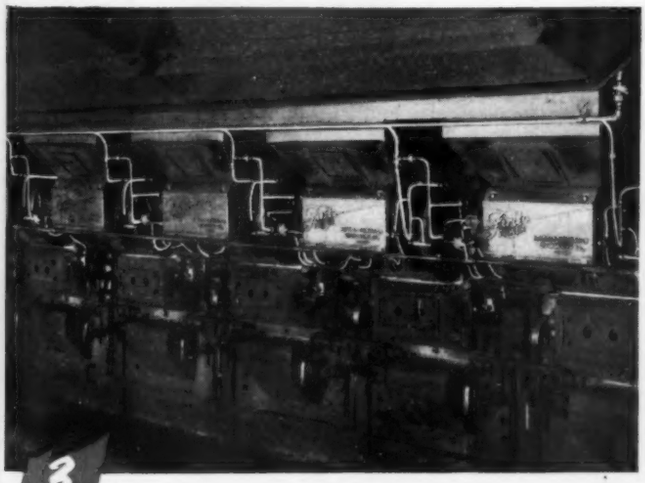


1.

Alemite Dual Progressive *Centralized* Lubrication System—Lubricates all bearings from one central point—delivering a metered quantity of grease or oil to remote bearings *without stopping the machine.* Can be operated with permanently mounted lubricating pump or any type of pressure gun operated manually or by power. Easy to install.

2.

Alemite Dual-Manifold *Centralized* Lubrication System—A full hydraulic operated system for large groups of medium and heavy duty machines. Ideal for handling a wide range of lubricants from light oils to heavy greases under extremes of heat and cold. Delivers pre-determined amount of lubricant to bearings from one central point *without stopping the machines.*



3.

Alemite LubroMeter *Centralized* Lubrication System—Designed for manual or automatic operation on large or small machines. A single lubricant line conveys oil or grease from central supply to hydraulically operated measuring valves which replace oil cups, pressure gun fittings and grease cups. Machines need *not* be stopped for lubrication.

See These Alemite Systems Work . . . Right at Your Desk

Have an Alemite Specialist demonstrate Centralized Lubrication Systems with working models you can examine, study and work right at your desk. He will give complete technical information about adaptation of Alemite Systems to your machines. No obligation. Write Alemite, 1870 Diversey Parkway, Chicago 14, Illinois. In Canada: Belleville, Ontario.

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In buying a valve, as in buying anything else, it's *value* you're really after.

What is the measure of valve value? Length of service life, efficiency of performance, time and expense required for maintenance . . . these are the principal factors.

In these and in all other elements of value, Lunkenheimer Valves have proved their superior worth throughout American industry, in wartime as in peacetime. Maintenance men everywhere rely implicitly on these *better values* because they know they are *better values—quality-built* in every detail, assuring longer and more efficient service with the very minimum of maintenance trouble and expense.

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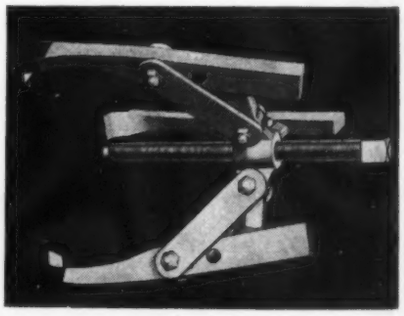
AIR DEVICES, LUBRICATORS, AIRCRAFT FITTINGS

all around. Tubular handle is positioned to form a protective bumper for stationery rack. Truck is fitted with four rubber-tired ball-bearing casters; two swivel at push-handle end, and the other two are rigid. Over-all height to top shelf is 42½ inches; to top of writing table, 50 inches; and floor clearance is 9½ inches. Writing table 20 inches wide by 14 deep. Palmer-Shile Co., 7110 West Jefferson Ave., Detroit 17.

Three-Arm Pullers

Line of triple-grip pullers, in same range of sizes as regular 2-arm pullers, with both long and short arms, is now on the market. The arms, forcing screws, straps, and cap-screws of the Gripomatic 2- and 3-arm



types are interchangeable. With the 2-arm puller, only the 3-way forged head and 1-arm assembly of corresponding size is needed to obtain a 3-arm puller. Owatonna Tool Co., 363 Cedar St., Owatonna, Minn.

Oscillating-Trough Conveyor

For handling sharp, jagged, abrasive, wet, oily, or hot material, oscillating-trough conveyor is now on the market. Consists of flexibly supported plate steel trough of rectangular cross-section, oscillated by an eccentric drive at speed resulting in a forward travel movement of 20 to 50 f.p.m. for materials, depending on their flowability, and on type of unit installed. Conveyor can be built to handle a range of capacities by making width and depth of trough of the size required, and by install-

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- ★ **EXCEPTIONALLY EASY TO APPLY by brush, dip or spray. As free-working as regular house paint.**
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- ★ **ODORLESS. No discomfort or hazard to painters or plant personnel.**
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- ★ **COVERS ALL SURFACES—concrete, metal, wood, paper, paint, etc.—WET OR DRY—with equal ease and effectiveness.**
- ★ **CAN BE RECOATED as often as desired without peeling or blistering.**
- ★ **EXTREMELY RESISTANT to acids, alkalis and moisture—hot or cold.**
- ★ **HIGHLY ADHESIVE; FLEXIBLE; DURABLE.**
- ★ **A PERFECT SEALER. Asphalt and other paints will not bleed through Pen-Kote 500.**

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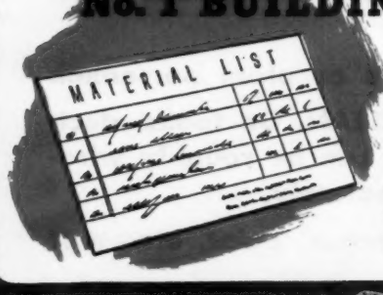
To build with Wolmanized Lumber is to build for permanence. This lumber defies decay and termite attack, assures longer life to your building projects.

Wood **THE NATION'S No. 1 BUILDING MATERIAL**



When peacetime construction gets under way, wood will again head the material lists of builders and contractors. Specify Wolmanized Lumber and get *all* of wood's advantages.

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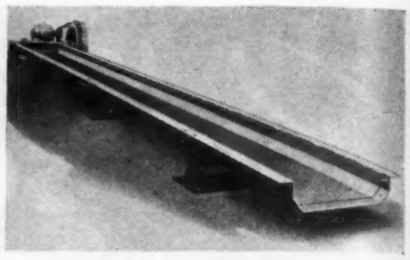
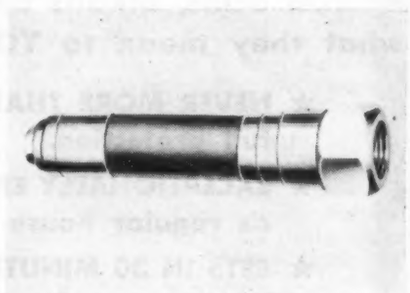


ing a power drive of proper horsepower. There is no spillage of material during conveying, as the conveyor action levels material off like water, maker states, and wear on trough is small because forward motion of material polishes the oscillating trough. Link-Belt Co., 307 North Michigan Ave., Chicago.

Air Blowgun

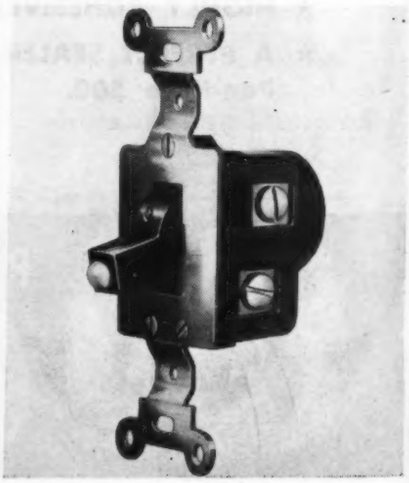
Redesigned Heco Flex-Tip blowgun is for application of air. Flexing the elastic tip, by pressure of thumb or finger, controls valve to release either a slight draught or a steady, high-pressure stream. Connections are brass, except the nose, which is



hardened steel. Has no handles, levers, triggers, springs, or pushbuttons, and can be dropped, thrown, or dragged without damage, according to the manufacturer. Available for ¼-in. standard pipe thread. Heckethorn Mfg. & Supply Co., Littleton, Colo.

Delay Timer

All-purpose light or power switch, called Tymzit, features toggle-lever arrangement for both delayed-action and instantaneous off. Time-selector can be set at any inter-



TOUGH STEEL
for tender fibers of nylon, rayon and silk

THE small steel parts shown above are used in hosiery knitting machines . . . handle the finest of fibers—silk, rayon, nylon. As many as 60 separate moving parts within an inch-wide space operate at high speeds for long periods of time.

That's why high-carbon Athenia steel for knitting machine parts is made to meet such an unusual combination of requirements. It is *high in tensile strength* so that the thinnest parts are strong; *hard* for long wear, but not brittle; *smooth in finish* so as not to snag fibers.

Add to that the fact that this steel must also be *easily machineable*—often receiving 5 or 6 different machinings in succession to form the intricate shapes shown above, and you can see why making steel for the knitting machine industry is such a precision job.

Here at Athenia, we make *not* the finished parts, but the *flat steel* from which these parts are fabricated. And we fully meet the needs of scores of *other* industries who have special steel problems. We may be able to do the same for yours. Write for further information about our experience in producing special steel flats for special purposes.

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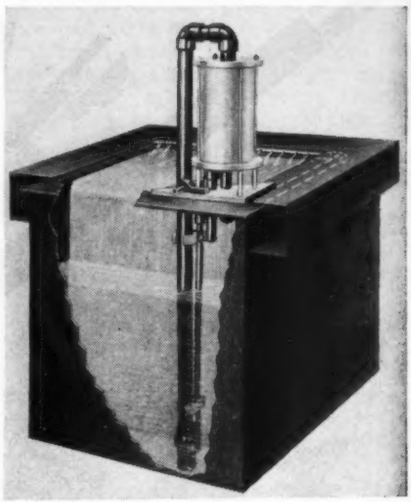
val from zero to three minutes. Toggle lever has phosphorescent tip. A small set-screw on toggle lever permits adjustment of the delayed-action interval, and, if desired, power or lights can be turned off instantly by a continuing downward push of lever. No clockwork or electrical elements are used in switch. Conforms to Underwriters Laboratories specifications. Fits standard wall box, and is offered in single and double pole assemblies; rated at 10 amperes at 125 volts, and 5 amperes at 250 volts. T. J. Mudon Co., 1240 Merchandise Mart, Chicago 54.

Acid Lift

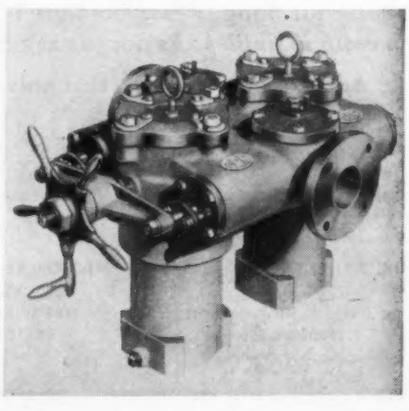
Suitable for use in the continuous skimming of acid dip tanks, acid lift unit is announced. Has no moving parts, and is operated by 6 pounds of air pressure. Built of corrosion-resistant materials—saran and micarta pipe and cylinder, with stainless



attachments. Device keeps the solution clean automatically, eliminating shutdowns for skimming, and a continuous dipping schedule may be maintained without fouling with unskimmed grease and oils, maker says. Lift is light in weight, and can be installed on any dip tank with sump arrangement. The George L. Nankervis

Pipeline Strainer

Co., 5408 Commonwealth, Detroit.
Duplex vertical chamber disk-type strainer has been designed to permit continuous flow in pipelines. It is operated by a large handwheel that reverses valves simultane-



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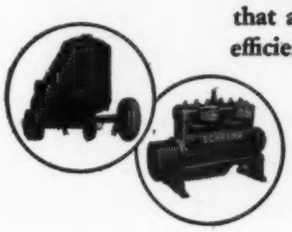

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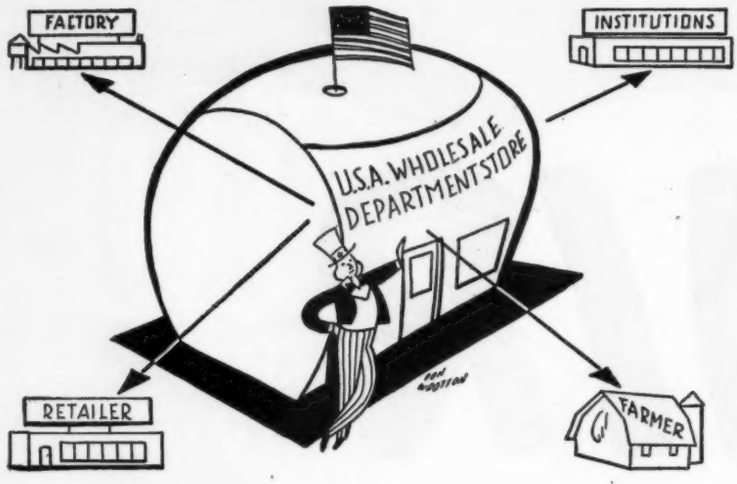

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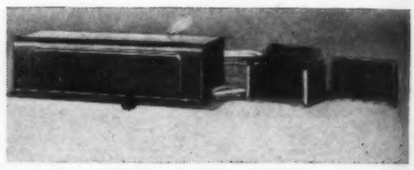
ously with minimum pressure drop to give capacity flow at all positions of the handwheel. Position of strainer basket with respect to basket chamber is eccentrical, to obtain a flow section proportional to flow needs at all points, thereby minimizing pressure drop. Removable covers provide access to basket chamber for cleaning. Handholes above each valve assembly permit servicing without removing strainer. Unit can be used to protect pumps, traps, valves, regulators, and other primary equipment. Made in cast bronze, steel, semi-steel, and cast iron. Basket is supplied in perforated brass, monel, or other specified metals. J. A. Zurn Mfg. Co., Erie, Pa.

Cold Cathode Ballast

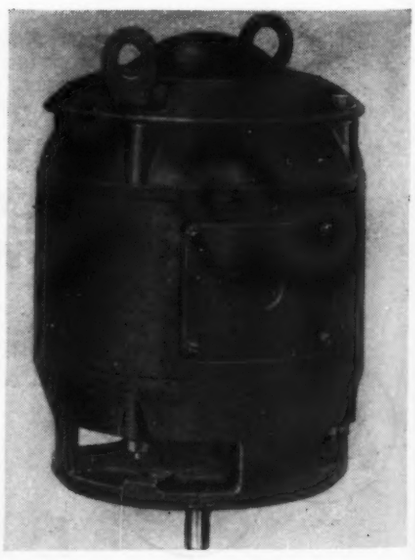
To fit manufacturer's cold cathode ballasts, junction box has been developed which can be attached with bolts used for mounting standard ballast. The box is made in two pieces—one is designed to slide over



guides on one end of ballast case, while the other forms cover, secured by one screw. Knock-outs are provided in sides, ends, and bottom. Device listed as standard by Underwriters' Laboratories. Jefferson Electric Co., Bellwood, Ill.

Vertical Motor

Addition to line of protected-type a.c. motors is a vertical drip-proof motor rated at 40 C. rise continuous duty with 15 percent service factor. Operates from 60- or 50-cycle, 3- or 2-phase circuits at standard voltages. NEMA "B" flange-type mounting up to and including the 284 frame, and "C" face-type mounting up to and including the 326 frame available. Ventilating openings of motors are shielded against the entrance of dripping liquids and falling particles. Oversized ball bear-



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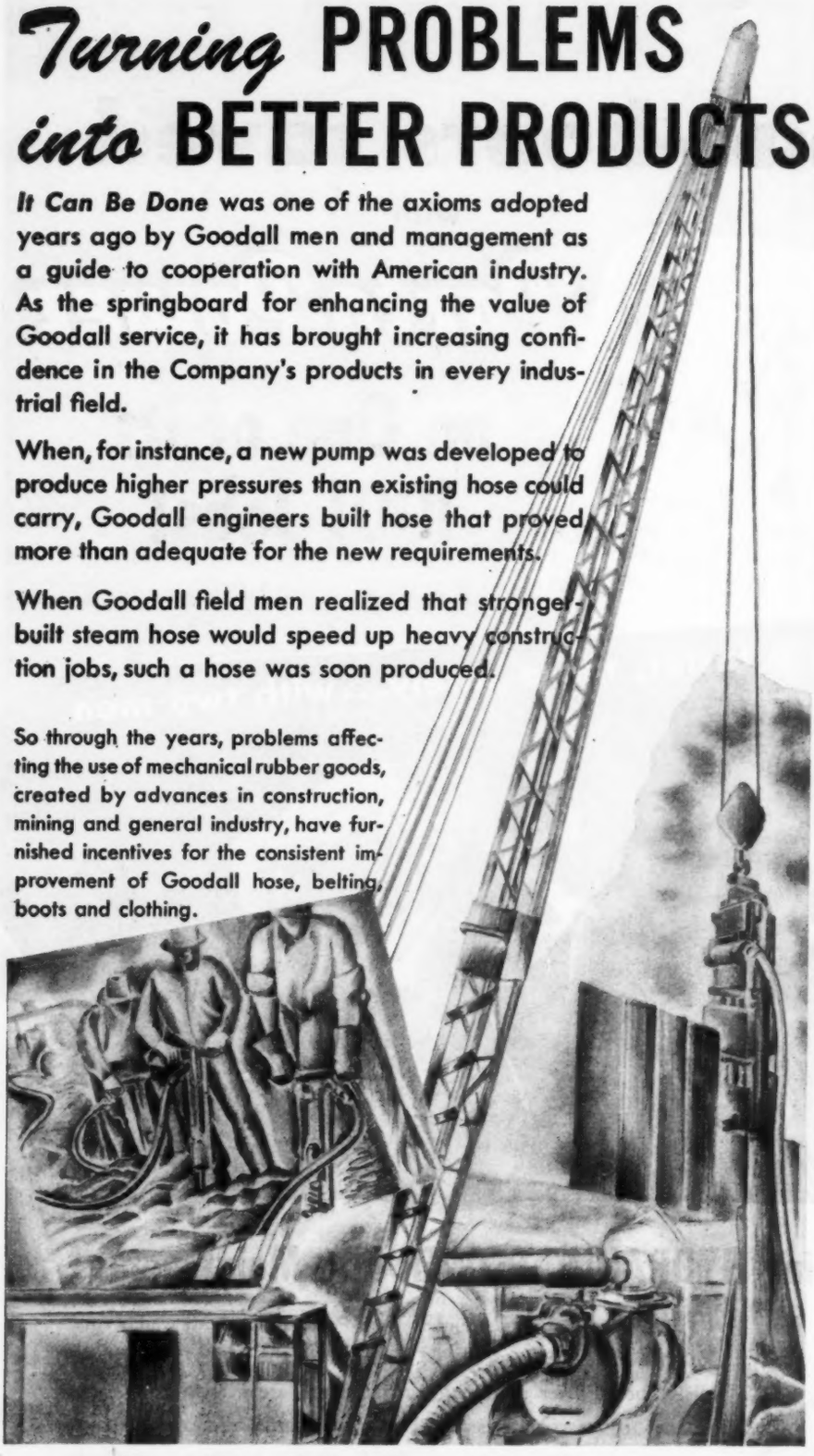
When, for instance, a new pump was developed to produce higher pressures than existing hose could carry, Goodall engineers built hose that proved more than adequate for the new requirements.

When Goodall field men realized that stronger-built steam hose would speed up heavy construction jobs, such a hose was soon produced.

So through the years, problems affecting the use of mechanical rubber goods, created by advances in construction, mining and general industry, have furnished incentives for the consistent improvement of Goodall hose, belting, boots and clothing.



GOODALL

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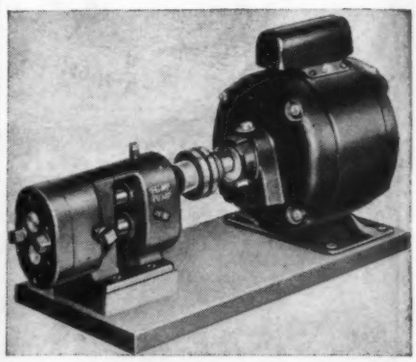
Factory: **Trenton, New Jersey** **Established 1870**

ings are provided to carry thrust in addition to the rotor, and company's centrifugal bearing seal is said to permit using soft grease. Alucast rotor, with bars, fans, and end rings cast in one operation from aluminum alloys, is used. Other features include recessed junction box, heavy cast frame construction, and coils protected with Vinylastic insulation. The Crocker-Wheeler Div. of Joshua Hendy Iron Works, Ampere, N. J.

High-Pressure Pump

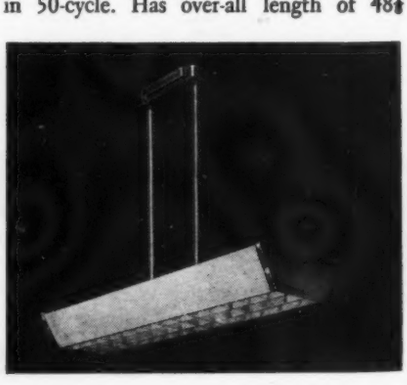
Adaptable for handling thin liquids or water up to 500-lb. pressure, and viscous liquids and oils to 1000 pounds, low-capacity high-pressure pump is announced. Flow is constant, regardless of pressure, and operates on vacuums up to 27 inches. Designed so that the impellers can be changed to handle capacities from 60 to



480 g.p.h., unit is furnished in standard foot-mounted model, to be driven directly by standard speed motor, 1200-1800 r.p.m. Can be supplied for either side intake and discharge, or intake and discharge on face plate. Made with mechanical seals, but also is available with conventional type packing. Standard models have bronze sleeve bearings or ball bearings throughout—or ball bearings and bypass with pressure relief valves. Bearings support either vertical or horizontal mountings. Bump Pump Co., La Crosse, Wis.

Fluorescent Luminaire

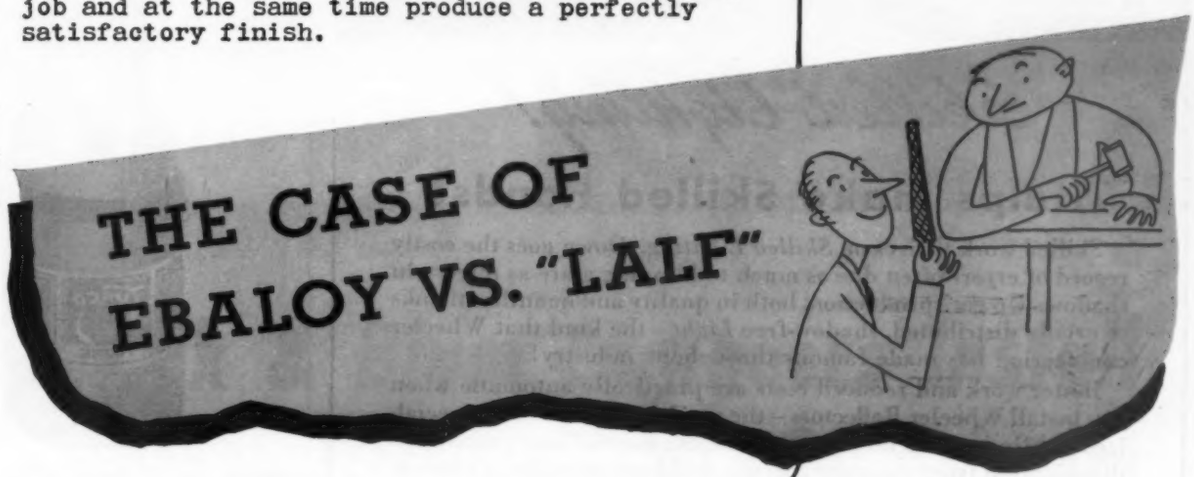
The Wilson No. A-4440 fluorescent luminaire features an egg-crate louver bottom which is said to eliminate dust, to shield tubes, and to provide glareless illumination. Hinged louver may be detached for maintenance. Unit utilizes four 40-watt T-12 fluorescent lamps operating on voltage of 110-125, 60-cycle a.c.; also available in 50-cycle. Has over-all length of 48½



Case history No. 187

Ebaloy is a tough alloy steel. "LALF" stands for Long Angle Lathe File. The two came to grips in a valve-manufacturing plant. In perhaps ninety cases out of a hundred this file will do a perfect job of lathe filing. But in this particular instance it didn't . . . it simply would not polish out Ebaloy valve stems smoothly.

A Nicholson service engineer had the solution. One way to do the job right, he explained, was to use the Long Angle Lathe File to remove the tool marks and then polish with a Mill Smooth File. A still better way, said he, was to use a Mill Second Cut* for the whole operation . . . because it could do a faster cutting job and at the same time produce a perfectly satisfactory finish.



NEW METALS, new products, new production methods are constantly creating new filing problems. It has long been a Nicholson policy to serve industry not only by making *Files for every purpose,* but to assist in selecting *The right file for the job.*

Another service that Nicholson feels it owes its customers is to contribute toward the proper use and care of files. This guidance is offered in the interest of more efficient workmanship, greater production and lower tool costs. One of the most helpful aids in the use of files is—

●

"FILE FILOSOPHY"—the interesting, profusely illustrated Nicholson 48-page handbook on kinds, use and care of files. It is FREE to industrial managements in quantities for judicious distribution around the shop, tool room and among production and purchasing heads. . . . And order Nicholson files from your mill-supply house.

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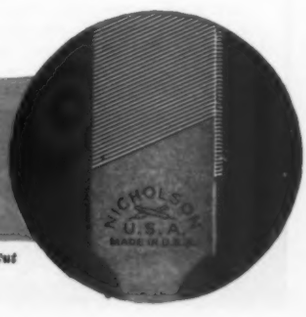
NICHOLSON FILES
FOR EVERY PURPOSE



*Nicholson Mill Second Cut

THE REFLECTOR IS THE BACKBONE OF ANY LIGHTING SYSTEM . . .

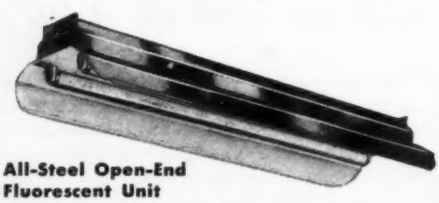
Skilled Lighting!

Helps make Skilled Hands!

Skilled work thrives on *Skilled Lighting.* Down goes the costly record of errors often due as much to blinding glare as uncertain shadow. Up goes production, both in quality and quantity, thanks to evenly distributed, shadow-free *Light* – the kind that Wheeler engineering has made famous throughout industry!

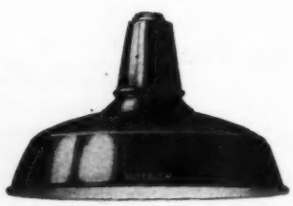
Better work and reduced costs are practically automatic when you install Wheeler Reflectors – the product of 64 years of specialized lighting experience. For they are engineered to get maximum illumination from *standard lamps.* And because of their efficient design, heavy duty materials, and high grade vitreous enameling, they stand up longer, require less maintenance.

Learn how you can lighten the load on your workers – and your operating costs. Send for catalogs showing complete line of incandescent and fluorescent lighting fixtures. **Wheeler Reflector Company, 275 Congress St., Boston 10, Mass.** Also New York. Representatives in principal cities.



All-Steel Open-End Fluorescent Unit

Available for two or three 40-watt, or two 100-watt lamps. Broad wiring channel with accessible, enclosed ballast. Can be mounted from chain or conduit, individually or in continuous runs.



RLM Solid Neck Incandescent Reflector

Maximum lighting efficiency for either indoor or outdoor use. Expertly designed, ruggedly built. 75 to 1500 watts.

Distributed Exclusively through Electrical Wholesalers

Wheeler Skilled Lighting REFLECTORS

Made by Specialists in Lighting Equipment Since 1881

inches, height of 7¾, and width of 15⅞ inches. Side panels are Skytex glass with Satinol finish. Louver bottom has sprayed and baked-on metallic silver finish; reflectors are heat-resisting white enamel; and end and outside surfaces are metallic silver. Luminaire can be surface- or suspension-mounted with hanger No. AH-200, individually or in continuous rows. Complete with 4-lamp high power factor auxiliary and FS-4 starters. The Pittsburgh Reflector Co., Oliver Bldg., Pittsburgh 22.

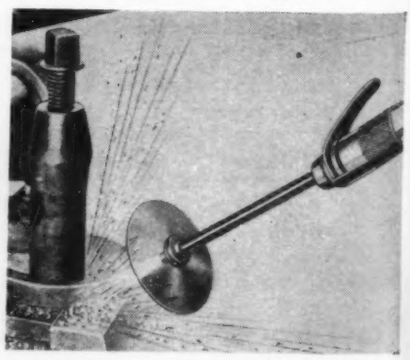
Cold Tank Cleaner

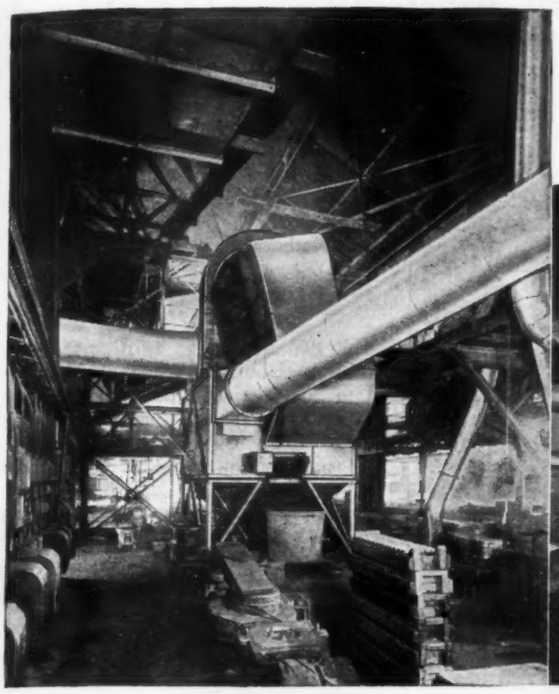
Fuzee is a self-sealing compound for use in cold tank immersion cleaning of pistons, fuel pumps, and carburetors, from which it removes carbon, engine varnish, and other adhesive dirt. Utilization of a compound on the surface of which a "seal"

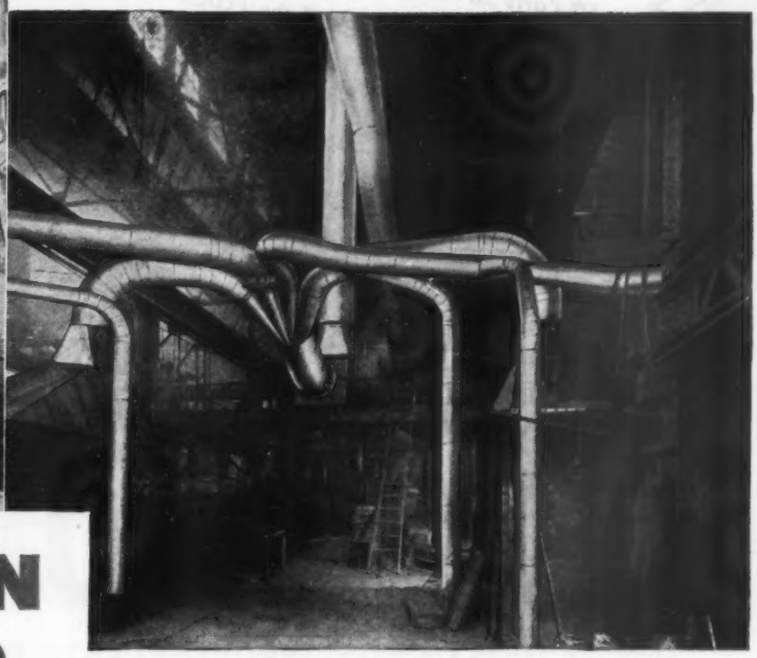
floats, is claimed to help eliminate flammability, fumes, and corrosion. Wetting action, emulsifying value, and penetrative powers are said to be increased. Dip-tank container is obtainable with a metal dip rack to fit the standard 5-gal. container, for cleaning small parts. Turco Products, Inc., 6135 South Central Ave., Los Angeles 1.

Blowgun Shield

Adaptable to standard blowguns, transparent safety shield is designed to stop or deflect chips and flying particles scattered by air blasts used in cleaning and dusting operations. Protects workers from eye injuries, but does not interfere with uses to which compressed air is applied, accord-







Two views of Dust Control System installed at G.H.R. Foundry Division of Dayton Malleable Iron Co. Air volume handled is approximately 103,000 CFM.

PRODUCTION CONTINUED

As Kirk & Blum Engineers Install Complete DUST CONTROL System

No interference with foundry production! This was among the major problems that had to be solved by Kirk & Blum "Air Engineers" in the installation of a complete, efficient, custom-built Dust Control System at G. H. R. Foundry Division of Dayton Malleable Iron Company, Dayton, Ohio.

The entire system was planned and designed to meet the requirements of this particular job—then erection was carefully scheduled and the entire installation made while *foundry production continued uninterrupted.*

G. H. R. is a small parts, high production foundry, and each unit of the dust control system had to be located so as to avoid interference with conveyors and other mechanical handling equipment.

***Modernize now*—with K & B Dust Control. Protect your workers' health, increase their efficiency, step up the quality and quantity of your production. Call on Kirk & Blum Engineers—backed by 38 years' experience in this specialized field. Write now for full information.**

SEND FOR BOOKLETS:

"Dust Collecting Systems in Metal Industries"
"Fan Systems for Various Industries"
"Blower Systems for Woodworking Plants"
"Industrial Ovens"
"Cooling Systems for the Glass Industry"
"Data on Kirk & Blum Production Facilities"

KIRK AND BLUM

The KIRK and BLUM MFG. CO. 2835 Spring Grove Ave. Cincinnati 25, Ohio

FEDERAL ELECTRIC PRODUCTS COMPANY, INC.
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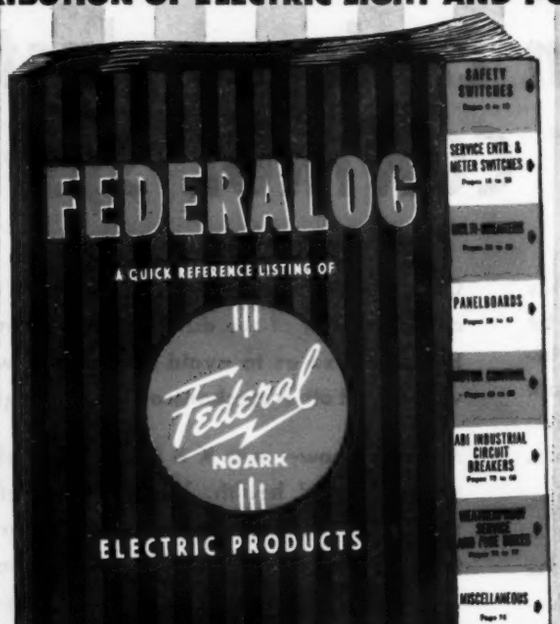
FEDERALOG

ONE OF TODAY'S MOST IMPORTANT CATALOGS ON EQUIPMENT FOR THE CONTROL AND DISTRIBUTION OF ELECTRIC LIGHT AND POWER



• No data file on electrical equipment is complete without a copy of the FEDERALOG . . . a dependable guide to the newest developments in Motor Controls, Safety Switches, Circuit Breakers, Service Equipment, Panelboards and Multi-Breakers.

FEDERAL ELECTRIC PRODUCTS COMPANY, INC.

EXECUTIVE OFFICES: 50 PARIS ST., NEWARK 5, N. J. • PLANTS: HARTFORD, CONN. • NEWARK, N. J.

to which compressed air is applied, according to the manufacturer. Shield is made of heavy-gage transparent plastic, formed into concave shape. Acts as bumper to protect blowgun from damage in rough handling. One standard size—Cat. No. 150—fits all sizes and types of blowguns. Special attachments are available for blowguns without removable noses. Diameter overall is 2⅜ inches. W. I. Martin & Co., 711 South Dearborn St., Chicago 5.

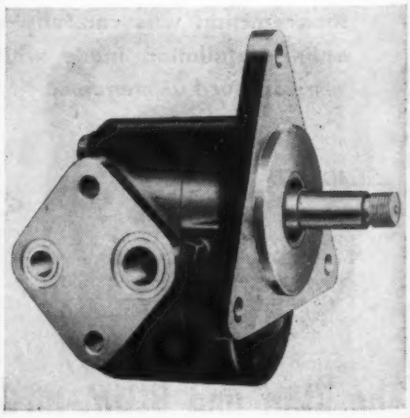
Small Air Hammer

Called Bantam Bully, small pneumatic hammer, weighing less than 2 pounds, is said to deliver 13,000 blows per minute, and to operate on less than 2 cubic feet of air at 80 to 100 lb. per sq. in. Valve, in trigger position, in pistol grip handle

controls operation. Tools are held in ball-and-channel locking chuck, and are released or locked by a ¼-turn of knurled nose of chuck. The only moving part, the piston striking member, is precision-fitted in cylinder. Travel of hammer piston is approximately ⅜ inch. Superior Mfg. Co., Public Square Bldg., Cleveland 13.

Hydraulic Pump

High volumetric efficiency is said to be featured in general-purpose hydraulic pump. Calibrations show volumetric efficiencies of 95 percent and better at 3000 r.p.m., under pressure of 1500 pounds p.s.i., according to the manufacturer. The gear-type pump, incorporating pressure-loading principle, is suitable for universal application where hydraulic power is utilized. Has triangular mounting pad, or SAE magneto



GRAPHITE GUS SAYS:

IT'S A JOB FOR GRAPHITE

to prevent failure of ordinary oil and grease

Use DIXON'S Lubricating Graphite on the tough spots. Rub it on dry. Add it to your regular oils and greases.

Dixon's Ticonderoga Lubricating Flake Graphite. Sleeky, large flakes or medium powdered, this graphite gives sustained friction freeing lubrication on packings, large free-fitting bearings, open gears, sprockets, chains and other heavy duty equipment. Add it to oils and greases to fortify them against extremes of temperatures, and pressures. It lengthens lubricant life. Data Sheet #5 tells where and how.

Dixon's No. 635 Lubricating Flake Graphite. This finely powdered graphite is particularly suitable for close-fitting bearing surfaces and mechanisms operating under high temperatures, pressures and speeds. It is extremely unctuous and is used dry. Added to oils and greases it lengthens their life and makes better friction fighters. Data Sheet #6 illustrates uses.

Dixon's Microfyne Lubricating Flake Graphite. Being microscopic in particle size, this lubricating flake graphite is especially processed to meet the largest variety of applications. As a co-lubricant in plain oils and greases it enables them to stand up under conditions of extreme heat, cold, speeds and pressures. Used dry it quickly establishes a friction-free surface. Data Sheet #7 shows other uses.

Dixon's Graph-Air Gun, Type 4. Handily blows its contents of dry Microfyne Graphite into locks and all close-fitting mechanisms. Provides long lasting lubrication that's exceptionally resistant to conditions that destroy ordinary lubricants. This powdered graphite will not gum or dry out. In plant, office, home, Dixon's Graph-Air Gun is the most useful lubricator ever. Data Sheet #8 lists many of its 1001 uses. Get your gun at Supply or hardware store—30¢.

ANSWERS!
HELPS! HINTS!

For help in a tough lubrication problem, Write Graphite Gus for illustrated Data Sheets on the product or products that interest you. They tell how and where you can make Graphite do the job—Better.

JOSEPH DIXON CRUCIBLE COMPANY

44C11 JERSEY CITY 3, NEW JERSEY

THEY'VE CAUGHT HIM EVERY DAY FOR A WEEK. HE KEEPS FALLING FOR THAT SLEEK, STRONG ROEBLING WIRE ROPE.
SMART BUYERS LIKE THE LOOKS OF OTHER ROEBLING PRODUCTS TOO-ELECTRICAL CABLE, WIRE SCREEN AND STRIP STEEL.

Roebling produces every major type of wire and wire product . . . house wire to telephone cable . . . bridge cable to wire rope . . . fine filter cloth to heavy grading screen . . . strip steel and flat wire to round and shaped wire . . . all Roebling products. *All* the result of over 100 years of wire specialization.
John A. Roebling's Sons Company, Trenton 2, N.J.

ROEBLING

PACEMAKER IN WIRE PRODUCTS

WIRE ROPE AND STRAND • FITTINGS • SLINGS • SUSPENSION BRIDGES AND CABLES
COLD ROLLED STRIP • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS
AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • AERIAL WIRE ROPE SYSTEMS • ROUND AND SHAPED WIRE • ELECTRICAL WIRES AND CABLES • WIRE CLOTH AND NETTING

flange, or is adaptable to other design mounting for special installations. Capacity rating is 3.5 g.p.m. at 1500 r.p.m., or 7 g.p.m. at 3000 r.p.m., and weight is 4.4 pounds. Pesco Products Co., 11610 Euclid Ave., Cleveland 6.

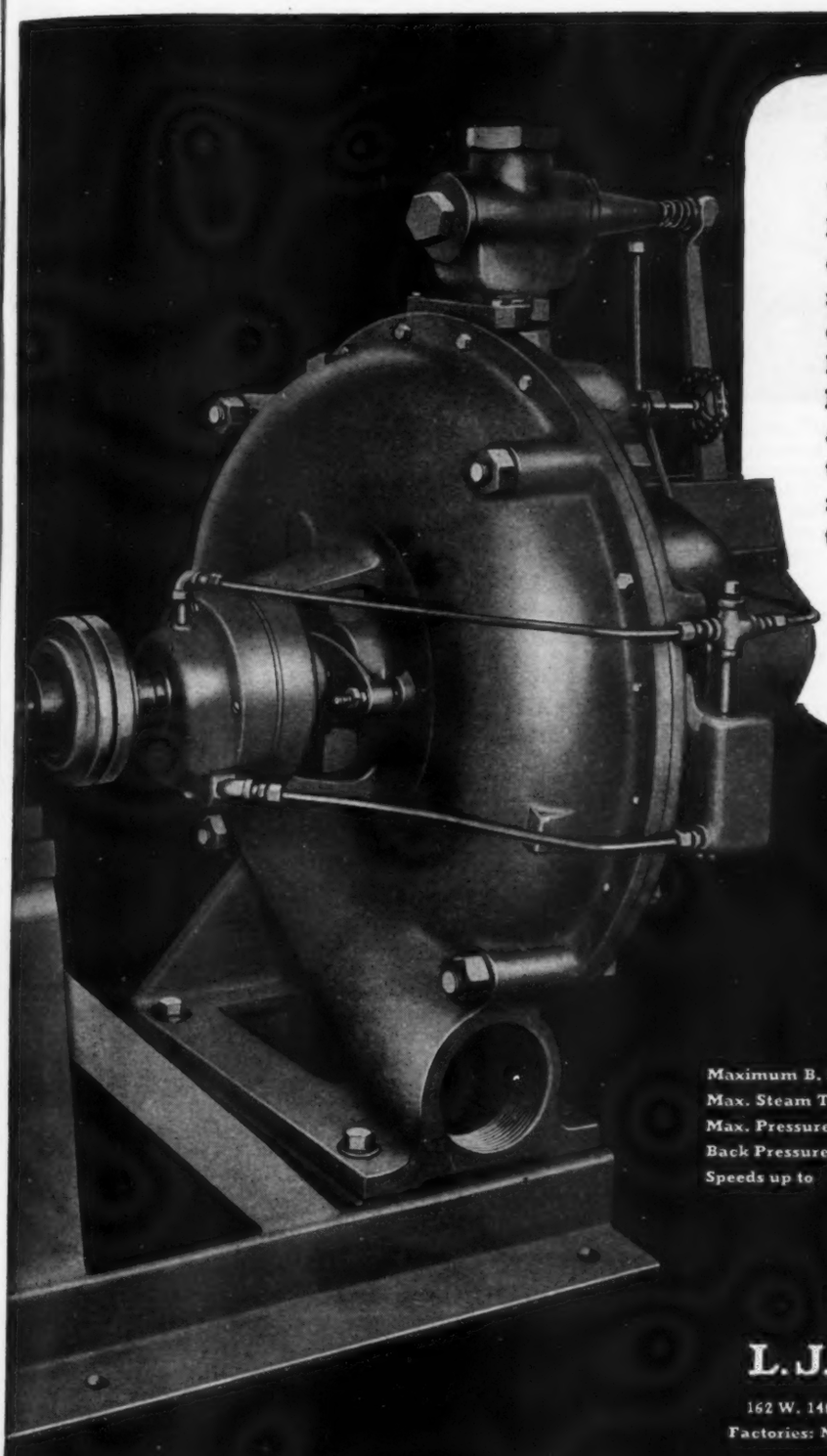
Motorized Truck

Load-carrying motorized truck is claimed to have safety rated capacity of 4000 pounds. Has stationary bed, and loads are placed on truck by hand, crane, or similar means. Fingertip control permits maneuvering of loads forward or back to destination. Consists of two buttons on handle, one for forward motion and one for reverse,

operating in conjunction with an Allen-Bradley controller unit. Also incorporates dynamic brake control. Speed is 312 f.p.m. when empty, and 220 f.p.m. loaded. Power is generated by heavy-duty batteries which are said to operate 10 to 20 hours under maximum load without recharging. Lift Trucks, Inc., 2425 Spring Grove Ave., Cincinnati 14.

Gearless Pump

Equipped with bearings which require only water lubrication, eliminating need for grease cups, gearless pump, for fresh or salt water, light oil, or other liquid circulating use, is presented. No adjustments are needed. Pump can be mounted at any angle and operated in either direction. It is claimed to prevent motor failures, and to avoid jamming or breaking of gears. Opening face plate allows quick removal of any obstructing material. Removable impeller is of resilient material composed of several



SIMPLICITY

Wing Steam Turbines have been a dependable source of power in industrial and marine applications for over a third of a century. In the operation of fans, blowers, pumps and other auxiliary drive equipment, their simplicity, their economical performance and their ability to stand up under adverse conditions are outstanding characteristics.

OPERATING RANGES

	STANDARD	HIGH PRESSURE
Maximum B. H. P.	100	150
Max. Steam Temp.	525 F.	750 F.
Max. Pressure	275 lbs.	600 lbs.
Back Pressure up to	50 lbs.	50 lbs
Speeds up to	4000 RPM	4000 RPM

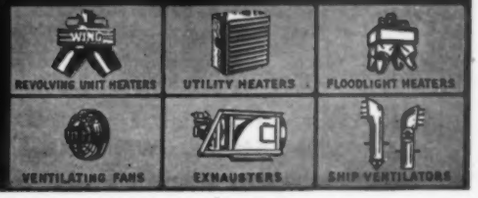
Write for Bulletin SW-1

L. J. Wing Mfg. Co.

162 W. 14th St., New York 11, N. Y.

Factories: Newark, N. J. and Montreal, Canada

Wing TURBINES



Maneuverability SPEEDS HANDLING —LOWERS COSTS

KRANE KAR doesn't have to face the work—just operate the "live" boom from side to side, by power, with full load on hook. Move forward or in reverse along a narrow aisle or ramp, pick up loads from either side, transport, and position them without changing vehicle's direction. Turn on a radius of 12 ft., clear through a door only 7 ft. high, climb ramps, weave in and out of obstructions . . . indoors and outdoors. This flexibility speeds handling of steel, machinery, fixtures, freight—loading, stacking, transporting—saves time and labor . . . keeps handling costs within reasonable limits. Write for Catalog No. 58.

USERS: Basic Magnesium; Monsanto Chem. Co.; Pullman Co.; Standard Oil; General Motors; Chrysler Corp.; General Electric; Otis Elevator Co.; Boeing Aircraft; etc.

Agents in the Principal Cities

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

2½, 5, AND 10 TON CAPACITIES

KRANE KAR

TRADE MARK REGISTERED

SILENT HOIST & CRANE CO., 855 63rd ST., B'KLYN 20, N.Y.

GRANT

Ball Bearing DRAWER SLIDES

Supreme Type "S" Slide . . . for installation on drawers and cases where smooth, fingertip operation is of utmost importance.

Make your cabinets smoother, easier to use and safer . . . by quick, easy installation of the "Grant".

Grant Ball Bearing Drawer Slides . . . save time in shop, toolroom or office, by assuring greater speed and convenience in drawer operation. Costly tools, gages, etc. are better protected by the smooth, safe drawer action and by the fact that there is never any possibility of drawers being pulled out too far and spilling the contents.

Types are available for all purposes and capacities. Attachment can be made to wood or steel cabinets by anyone who can handle a drill and screwdriver.

Made of rust-resisting plated steel in any desired length. Investigate today by sending for illustrated literature.

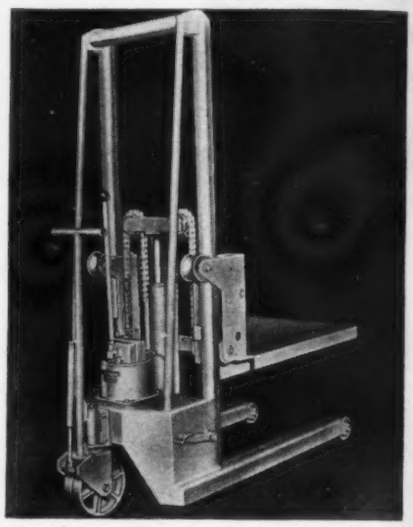
GRANT PULLEY *and* HARDWARE CO.

33-42 57th Street, WOODSIDE, *Long Island, New York*

layers of laminated sections, vulcanized together under pressure. It enables sandy, muddy, or gritty particles to pass without harm to pump. Unit is available with single impeller and standard ½-in. connection, and double impeller with standard 1-in. connection. Eco Engineering Co., Dept. 33, 12 New York Ave., Newark 1, N. J.

Hydraulic Lift Truck

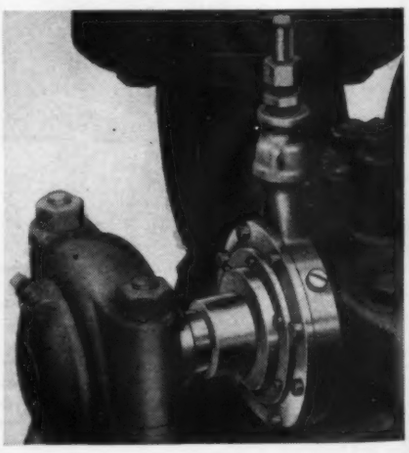
Employing lightweight welded tubular and formed plate construction, a 2000-lb. capacity hydraulic high-lift truck is announced. Suitable for transferring materials as well as for stacking and tiering. Standard stock model has 30x36-in. platform with elevating range from 6 to 60



inches above floor. Equipped with 10-in. diameter front and 5-in. diameter rear wheels. Foot-operated floor lock, making 2-point contact with floor, holds truck in position. Two-speed hydraulic hand pump is standard equipment; or motor-driven hydraulic pump may be furnished. Lyon-Raymond Corp., 2386 Madison St., Greene, N. Y.

Pump Shaft Seals

Heat-resistant, non-corrosive seals for horizontal centrifugal pumping units, are claimed to eliminate waste of fluid, packing expense, and the causes of sleeve and shaft wear, as well as to reduce power in-



The New KENNAMILL "UNIVERSAL" FACE MILL

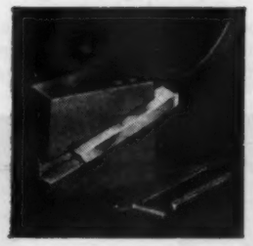
WITH WEDGED-IN, SOLID KENNAMETAL BLADES

Reduces

- ✓ PRODUCTION COSTS
- ✓ TOOLING COSTS
- ✓ OFF-THE-JOB TIME
- ✓ GRINDING EXPENSE

ADAPTABLE FOR HIGH RATE MILLING ON ALL TYPES OF METAL

"Universal" Cutters for milling different materials vary only in the grade of Kennametal used in the blades, and the cutting angles. Kennametal blades are wedged into the body at fixed angles of 14° positive radial and 7° negative axial. Before being inserted, they are ground to provide a radial rake suitable for the material to be milled—7° negative for steel; 5° positive for cast-iron, brass, and bronze; 14° positive for aluminum and magnesium alloys. Only the blades are ground—the steel body is a permanent tool holder.



BLADES ARE RESHARPENED ON SURFACE GRINDER

Kennametal blades are reground uniformly to proper angles on a surface grinder, while being held in a simple jig. Illustration shows Kennametal blade in jig having top land ground, which, in conjunction with fixed blade angle in body, provides proper radial rake. Jig rests on another face for grinding clearance angle, and on a third face to grind face cutting edge angle. For finish cuts the face of the cutter is touched up on a cutter grinder. Reconditioning consumes much less time than is required for conventional cutters. Additional time is saved by having resharpened spares ready for quick replacement.

The Kennamill "Universal" Face Mill can be used for milling different materials, at high rates of metal removal, simply by interchanging blades having the right grade of Kennametal and proper cutting angles. Advanceable, solid Kennametal blades are wedged into the sturdy steel body at fixed angles, after having been ground on the edge to provide an effective cutting angle—negative radial rake for steel; positive radial rake for cast-iron and non-ferrous materials.

All design features of this cutter contribute to the possibility of removing a large volume of metal between regrinds. Radially set blades, rigidly supported, maintain their edge longer; and, because the blades are wedged-in instead of brazed-on, brazing strains are eliminated, either initially or during grinding. Hogging cuts, up to a depth of ⅛", are entirely feasible. Ample chip accommodation is provided for all depths of cuts.

The solid Kennametal blades can be reground on a surface grinder, as described at the left, thus eliminating need for special cutter grinders, and greatly reducing off-the-job-time required for reconditioning cutters having brazed-in tips. Blades can be resharpened many times, then used in smaller "Universal" Cutters.

The Kennamill "Universal" Face Mill is available in four sizes—4", 6", 8", and 10". Prices and particulars are yours for the asking.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

Pharmaceuticals have moved into the CLEAN AIR ZONE

Like so many products closely affecting our daily lives, pharmaceuticals must be made under the strictest hygenic conditions. Cleanliness, being essential, electronic air filtration was the definite answer to the problem because it not only arrests the most finely divided foreign particles, but also prevents contamination by air borne bacteria. AAF Electronic Filters are serving all types of American industry. Write us today about your dust problems—there's no obligation. American Air Filter Company, Inc., 361 Central Ave., Louisville 8, Kentucky. In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF Electronic AIR FILTRATION

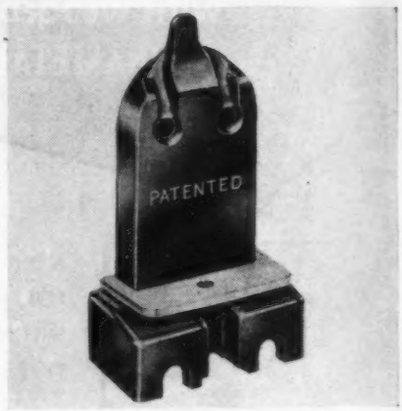
Of particular interest for

FOOD PRODUCTS • DEPARTMENT STORES • PHARMACEUTICALS
FACTORY AIR CONDITIONING • BACTERIA CONTROL • TEXTILES
TELEPHONE EXCHANGES • ART GALLERIES • FILM PROCESSING
HOSPITALS • OFFICE AND PUBLIC BUILDINGS • LIBRARIES

put. Liquid under pressure from top of pump is directed into low pressure area of pump. Flow is through liquid box, inward past orifice plate, and back into pump. Shaft sleeve turns with shaft, but is not in contact with orifice plate. Diaphragm provides leak-proof seal while pump is not in operation. Contact with shoulder of shaft sleeve is only momentary, when pump is starting or stopping. Jet Shaft Seals, Inc., 1452 South San Pedro St., Los Angeles 15.

Fluorescent Lamp Holder

Known as Flex-Loc, lamp holder is flexible, automatic, and self-adjusting to variations in length of lamps, or to the spacing of mounting holes in reflector units. Has automatic lock, eliminating extra locking devices, and is said to stand shocks and vibrations without loosening contact. Pat-

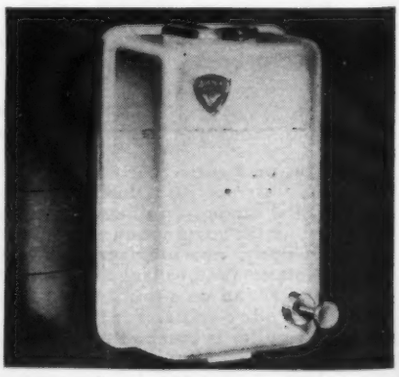


ented contacts grip both sides of lamp pins. Projecting tab on lamp holder serves as guide for inserting and removing lamp, and tapped hole in mounting bracket eliminates need for mounting nuts. Adapted to all types of fixtures, holder is molded from plastic with high dielectric strength. Lloyd Products Co., Providence 5, R. I.

BACK ON THE MARKET

Soap Dispensers

Soap dispensers again are available, with announcement of improved Models 21, liquid, and 31, powdered, soap dispensers.



Both have gravity feed systems. Bobrick Mfg. Corp., 2619 Santa Fe Ave., Los Angeles.

Big News FOR MAINTENANCE MEN!

RUBBERLIKE FLOOR RUNNER "RESISTS" ARMY OCCUPATION

Thousands of Feet of "The Marathon Runner" Save Wear and Tear on Famed University's Floors During Officer Training Program

UPKEEP COSTS DROP

More news of Rubberlike's low-cost floor protection comes from a world-famous university. Policy of the institution prohibits us from giving its name but we have approval to quote from its letter in our files:

"We purchased several thousand feet of Bird Rubberlike Runner to protect our yellow rubber floors during the period of Army occupation of our building. Two economies were effected:

1. There was no wear whatsoever on our original flooring.
2. There was considerable economy and saving of maintenance work and waxing.

In fact, the installation proved so satisfactory that even after the Army left we are still using it because of the economies in maintenance involved."

It's the same story on all heavy traffic floors. In schools, hospitals, restaurants, hotels, institutions, factories, offices, Rubberlike saves floors and maintenance expense. Its sturdy corrugations cushion footsteps, quiet traffic, make cleaning easier. Non-skid when wet, it's a boon where tracked-in rain or splashed water are safety hazards. Rubberlike lies flat and hugs any surface without cementing. Edges will not curl.

You can give *your* busiest floors Rubberlike protection for LESS THAN 6¢ PER SQUARE FOOT. Available in 36" width, 25 yards to the roll. Call your supply house or write for free sample to Bird & Son, inc., Dept. 611, East Walpole, Mass.

1795 OUR 150th Anniversary 1945

THE 10-SECOND STORY OF **RUBBERLIKE***

WATERPROOF · HEAVY DUTY · NO SPECIAL UPKEEP
SKID-PROOF · QUIETS TRAFFIC · HUGS ANY FLOOR
EXTRA RESILIENT · NO CEMENTING NECESSARY
LOW COST · LONG LIFE · PRESERVES FLOORS

*Reg. U. S. Pat. Off.

BIRD Building Products SINCE 1795

Men who know the best know

BIRD

ASPHALT SHINGLES · INSULATED SIDINGS · INSULATION BOARDS
FLOOR COVERINGS · WALLBOARDS · BUILDING PAPERS
RUBBERLIKE FLOOR RUNNERS · INDEX PRESSBOARDS · SHIPPING CONTAINERS
SHOE CARTONS · BUILT-UP ROOFS · BIRD-FIBRE WOOD FRAME CASES

BIRD & SON, inc., East Walpole, Mass. · NEW YORK · SHREVEPORT, LA. · CHICAGO, ILL.

☆ IF THESE OR SIMILAR LIQUIDS ARE HANDLED IN YOUR PLANT

Acids	Molasses
Alcohols	Oils
Asphalt	Paints
Beer	Rosin
Butane	Soaps
Dyes	Soups
Fuel Oil	Syrups
Gasoline	Tallow
Glue	Tar
Mash	Tomatoes
Mayonnaise	Yeast

Investigate

BLACKMER ROTARY PUMPS

SELF-ADJUSTING FOR WEAR

When the "buckets" (swinging vanes) finally wear out, a 20-minute replacement job restores the pump to normal capacity. Twenty years of service is not unusual.

Write for Bulletin No. 306—
Facts About Rotary Pumps

BLACKMER PUMP COMPANY

2100 Century Ave., Grand Rapids 9, Mich.

POWER PUMPS
HAND PUMPS
EZY-KLEEN STRAINERS

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• LABOR RELATIONS BUREAU as a function of a local Chamber of Commerce. Folder describes consultative services and general plan adopted by Brooklyn Chamber of Commerce, 26 Court St., Brooklyn 2, N. Y.

• ANALYSIS OF PROBLEMS of industry in economic-political field is provided in frequent issues of "Memo to Management," 2-page leaflet. Primarily for association members but available to others on request. Frank Rising, general manager, Automotive & Aviation Parts Manufacturers, Inc., 800 Michigan Ave., Detroit 26.

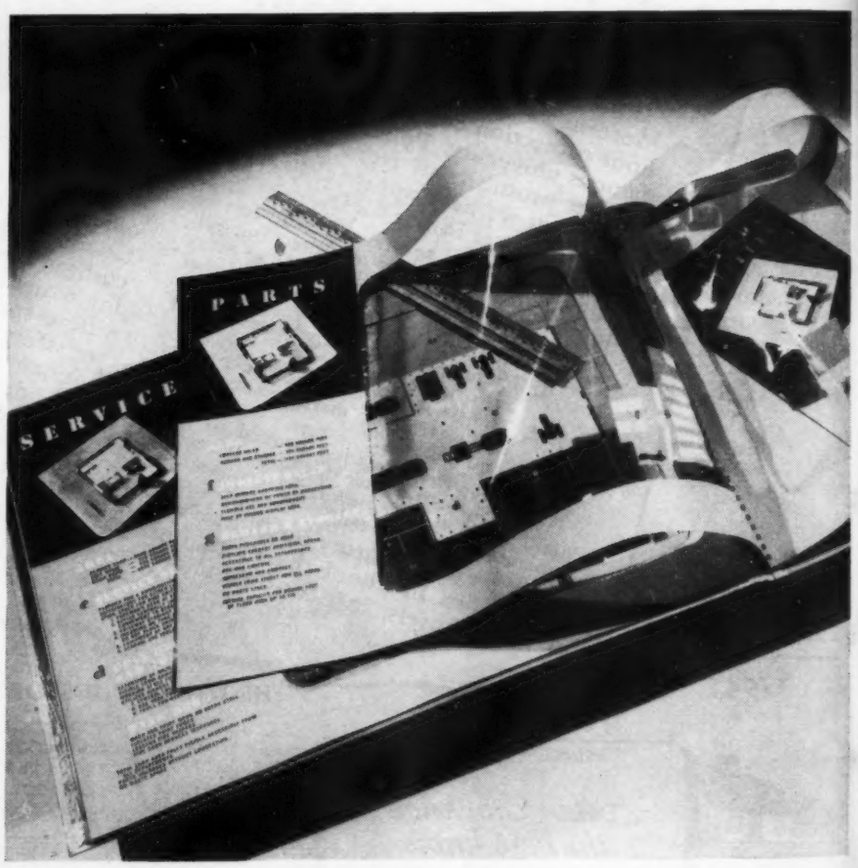
• WELCOME AND GUIDANCE for returning veterans are combined with exceptional effectiveness in illustrated booklet, "Back to Work." Sample copies can be obtained by executives. York Corporation, York, Pa.

• ZINC-COATED WIRE with certain advantages over tin coating providing rust resistance, solders well, and protecting against some acid and gas fumes. Johnson Steel & Wire Company, Inc., 53 Wister Ave., Worcester, Mass.

• EMPLOYEE UNDERSTANDING of company facts, policies, and rules, transmitted persuasively in "Working Together" manual. United Specialties Company, 9705 Cottage Grove Ave, Chicago 28.

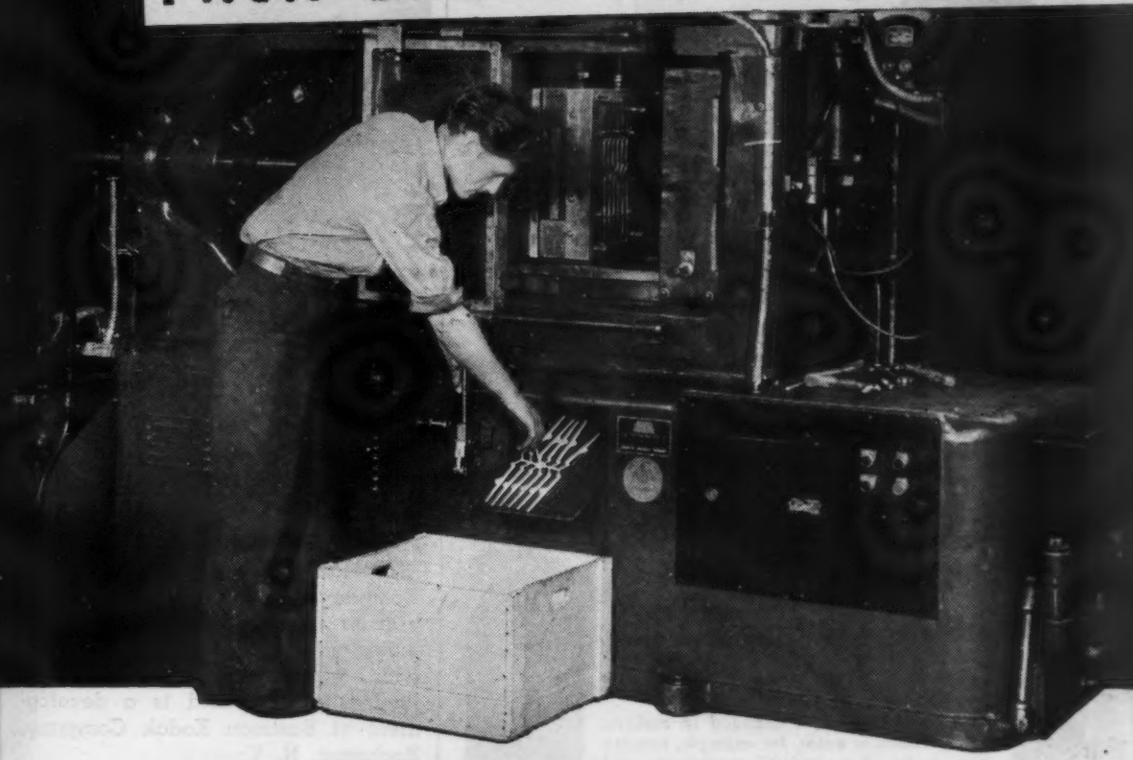
• CONTRIBUTION OF TECHNOLOGY to achievements in war, and possibilities in peace, described in booklet, "We Did It This Way," on behalf of Western Electric Company, Inc., 195 Broadway, New York 7.

• PATENTS AND YOUR TOMORROW, new booklet, showing how patent system benefits all people. Explains how system works and predicts many scientific



LAYOUT MAKING in which items or functions are classified into groups and are shown in separate groups on transparent sheets permits each category to be studied individually as an aid to clarity, but also permits entire layout to be studied as a whole when the sheets are superimposed upon each other. For the transparent medium, International Harvester Company uses Lumarith, made by Celanese Plastics Corporation

KEEPING A MACHINE FROM BREAKING ITS KNUCKLES



SUN LUBRICANT . . . Withstands Wiping-Action of Cams, Eliminates Breakage of Knuckle-Joints on Plastic-Moulding Machines

A New England manufacturer faced a serious problem in the design of an injection-moulding machine. The cams were wiping the grease off themselves with the result that the knuckle-joints were breaking.

A highly adhesive grease which could resist the wiping-action was suggested by a Sun Engineer who was called in. After three months of testing, the new grease was adopted and is now recommended for all machines of this type. Smooth action of the mechanism is insured, and knuckle-joint breaking has been eliminated.

To guarantee smooth action and long life of your machines, call the Sun Engineer in your neighborhood. Sun Engineers and Sun lubricants are saving machinery, materials, money, and man-power in hundreds of different plants.

One manufacturer doubled tool-life, when he switched to a Sun cutting oil. Another saved 35% on Diesel lubricating-oil consumption. A coal mine reduced overall lubrication-costs by 20%. These are typical examples of *Saving With Sun.*

If you are interested in getting production up and costs down, call the Sun man near you, or write . . .

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

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OILS FOR AMERICAN INDUSTRY

Air Express speeds the delivery-day of YOUR NEW REFRIGERATOR

The day is here when industry is getting back into the production of consumer goods on schedule. And Air Express is greatly speeding the program.

War plants now engaged in making refrigerators or autos, for example, require new tools, dies, critical machinery and parts. Via Air Express, such material is obtained in a matter of hours — delivery speed that can gain days and weeks of conversion time.

Specify Air Express-a Good Business Buy

When time means man-hours saved, production gained, a customer made — Air Express "earns its weight in gold," as thousands of firms, large and small, have learned.

Shipments travel at a speed of three miles a minute between principal U. S. towns and cities, with cost including special pick-up and delivery. Same-day delivery between many airport towns and cities. Rapid air-rail service to 23,000 off-airline points in the United States. Service direct by air to and from scores of foreign countries.

AIR MILES	2 lbs.	5 lbs.	10 lbs.	25 lbs.
250	$1.04	$1.25	$1.57	$2.63
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1000	$1.26	$2.19	$3.74	$8.75
2500	$1.68	$4.20	$8.40	$21.00

AIR EXPRESS

AIR EXPRESS

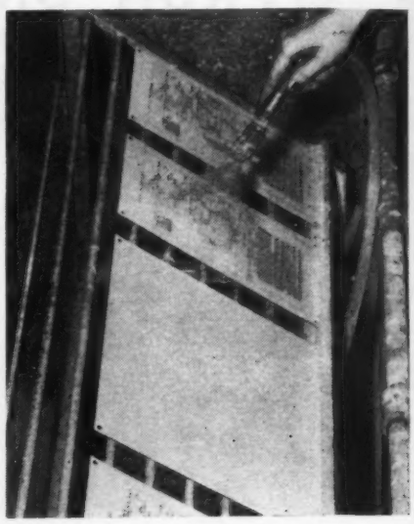
GETS THERE FIRST

Write Today for interesting "Map of Post-war Town" picturing advantages of Air Express to community, business and industry. Air Express Division, Railway Express Agency, 230 Park Avenue, New York 17. Or ask for it at any Airline or Express office.

Phone AIR EXPRESS DIVISION, RAILWAY EXPRESS AGENCY
Representing the AIRLINES of the United States

wonders to come. National Association of Manufacturers, 14 West 49th St., New York 20.

• BETTER USE OF TELEPHONES and especially the importance of politeness, pleasing voice tones, and pronunciation as described in "Your Company's Voice." Single copies available from New York Telephone Company, 140 West St., New York.



PHOTOSENSITIVE PAINT known as "Transfax" is used at General Electric Company's Schenectady plant to transfer wiring diagrams to metal plates. Fast and simple process ends with application of lacquer by spray. Photographic method is a development of Eastman Kodak Company, Rochester, N. Y.

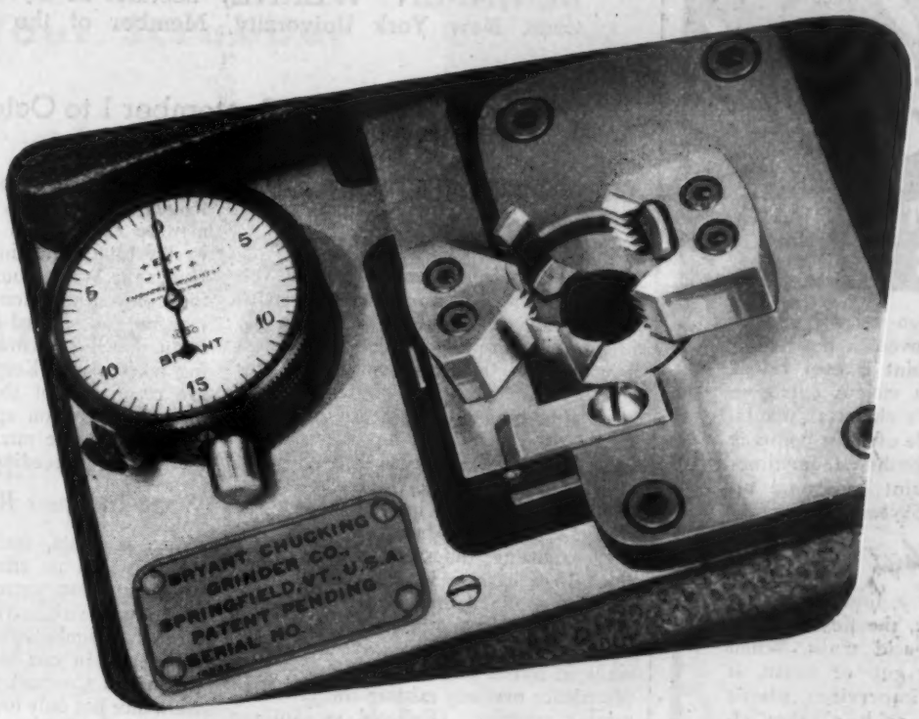
POST-WAR PLANS of Bendix Radio Division of Bendix Aviation Corporation, Baltimore, as outlined in a special edition of the *Bendix Beam*, the employee publication. What is to be made, how it is to be distributed, and the men in charge of the program are shown, for the information of Bendix workers.

NEW FILMS: Golden Horizons, the story of copper-base alloys and their development over a period of centuries, told in 33-minute sound and color motion picture. Written, produced and acted by employees of Ampco Metal, Inc., 38th & Burnham Streets, Milwaukee. Available for schools and technical groups.

Swaging, a 16-mm, 26-min. film, with commentary in English, French, Russian, and Spanish, shows applications of the swaging process for pointing, shaping, and attaching fittings to bars, cables, and tubes. Standard Machinery Company, Providence 7.

Peace Comes to America, *Objective Security*, *It's Your America*, and other titles of 16-mm. sound films keyed to the Victory Loan Program, available from Motion Picture and Special Events Section, War Finance Division, U. S. Treasury Department, Washington.

How to speed thread inspection . . .



Bryant Thread Gages

☆ This new Bryant Thread Gage Catalog describes all the advantages of these unusual gages . . . it tells how you can inspect internally and externally threaded parts four or five times faster . . . it tells how threaded parts can be inspected *all* over in a matter of seconds . . . it describes and illustrates three standard and one special model for work from 3/8" to 8" internal and 3/16" to 8" external. A free copy is yours for the asking!

send the coupon

BRYANT

CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT CHUCKING GRINDER CO.
Springfield, Vermont, U. S. A.

Please send me Catalog No. G3 which gives complete details on the Bryant Thread Gages

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

TRY
THIS PROVEN
Tygon Paint
WHERE OTHER PAINTS
HAVE FAILED

Tygon corrosion-resistant plastic Paint has been proven in the toughest service any paint is ever called upon to face—the vicious corrosive fumes in America's chemical plants. Here where the life of most paints is measured in months (sometimes weeks) Tygon Paint has stood up for 1, 2, 3, even 5 years.

Here's Why:

Tygon Paint is a liquid form of Tygon sheet stock, the flexible plastic used to line acid tanks. When applied by spray gun or brush, it forms a tough, impervious plastic "skin" that resists acids, alkalies, alcohols, oils, fresh or salt water.

OTHER THINGS ABOUT TYGON PAINT YOU'LL LIKE!

1 It will not become brittle with age.
2 Will not crack, craze, chip or weather.
3 As easy to use as any ordinary paint.
4 Flexible, elastic film withstands impact.
5 Cleans easily — gloss retaining surface.
6 Possesses high dielectric strength.

Would you like a sample for your own tests under your own conditions? Write today to

PROCESS EQUIPMENT DIVISION
U. S. STONEWARE
Since 1865 • Akron, Ohio

Significant Labor Developments

BENJAMIN WERNE, Lecturer in Government Regulations, New York University, Member of the New York Bar

Period Surveyed: September 1 to October 1

TREND INDICATORS

Veterans' Superseniority Sustained

By virtue of a federal court's decision, veterans are entitled to a superseniority status in reemployment. Thus, the veteran has a right to obtain his former job even though it may mean the demotion or discharge of other employees with greater seniority, in violation of contract seniority provisions. In the case involved, the veteran, after being reinstated, had been laid off while other non-veteran workers with longer seniority records had been retained. The veteran's layoff had been made pursuant to the company's union contract which provided that decrease in the working force be based upon length of service. The court pointed out that the Selective Service Act was enacted to preserve veterans' rights while in service and that the statute took precedence over any existing collective bargaining contract. (Fishgold vs. Sullivan Dry Dock & Repair Corporation, USDC E. N. Y.)

Employment of Girls Under 18 Prohibited

Under a recently issued order from the new Secretary of Labor, employment of girls under 18 for work on government contracts subject to the Walsh-Healey Act must cease on September 24, 1945, instead of the previously announced date of October 1. Employment of 16- and 17-year-old girls will still be permitted, however, on contracts awarded on or prior to September 4, 1945. Such employment will be subject to the six conditions previously in force. Included among these conditions are: (1) That no girl under 18 years of age be employed for more than 8 hours in any one day, or between the hours of 10 p.m. and 6 a.m., or in any way contrary to state laws governing hours of work; (2) that no girl under 18 years of age be employed in any operation which is held to be hazardous under the Fair Labor Standards Act or any state law; and (3) that a specific and definite luncheon period of at least 30 minutes be regularly granted.

Employment of Minors

Employment of minors—i.e., those in the 14 to 16 age group, may be continued for the winter in part-time jobs provided such employment is not in excess of 18 hours a week. Three hours is the limit on the number of hours a minor may work on a school day; however, on Saturdays, they may be employed 8 hours, provided the weekly total is not in excess of 18 hours. Under the Wage-Hour Law, they may perform only strictly non-production jobs and may not be engaged in work in the same room in which manufacturing or processing takes place. Keep on file the official age certificates of the minors employed; do not depend on applicants' statements, because they are rarely accepted as proof in violation proceedings.

Wage Increases Reimbursable

Wage increases, including fringe adjustments, which are effected by cost or cost-plus contractors pursuant to an order of a government stabilization agency, are proper items for reimbursement by the War Department. In one instance the War Department's Contract Appeals Board made allowance not only for the direct labor costs incurred through a wage increase but also for additional office expenses and for resultant wage increases to supervisory employees. Because of the error made by the contracting officer who included outdated wage rates in the contract, the latter had to be amended to reflect the higher rates set by the Wage Adjustment Board. Because of this, the board allowed the contractor all expenses incurred in the contract alteration.

Reimbursement for Pay

All holders of cost-plus-a-fixed-fee or other cost-type contracts are entitled to reimbursement for straight-time pay given to employees who did not work August 15 or 16, and for time and one-half pay given to employees who worked on those two days.

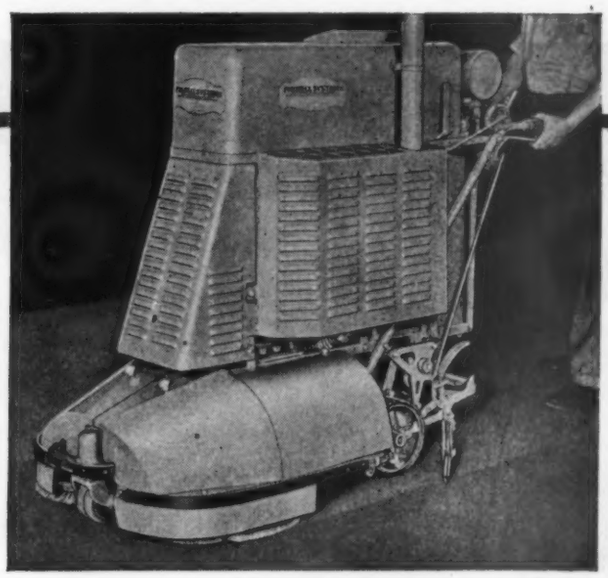
In the case of severance pay, however, the Office of Contract Settlement has made provision that fixed-price contractors be reimbursed for the "reasonable" costs of severance payments required by statute, by a collective bargaining contract, or the operation of an established policy which constitutes an implicit agreement. Although these rules do not apply to cost-type contracts, they may be used to settle claims arising under such contracts, except that the claims will be decided on an individual case basis.

Release of Overtime Unenforceable

Employees' releases for overtime, granted in

To Cut Operating Time of Your Scrubber

Choose



Cleansers Specially Compounded *for* Machine-Scrubbing

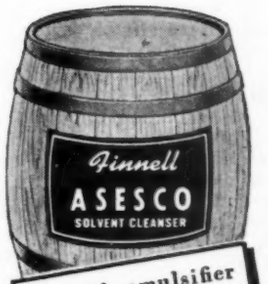
Emulsifies grimy oil and grease on mill and factory floors.

For heavy duty scrubbing of hard surface floors. Greaseless.

Used wherever a good *soap* powder is needed.

Endorsed by Rubber Flooring Manufacturers Association.

For conditions requiring a mild abrasive cleanser.



An oil emulsifier and an excellent water softener.

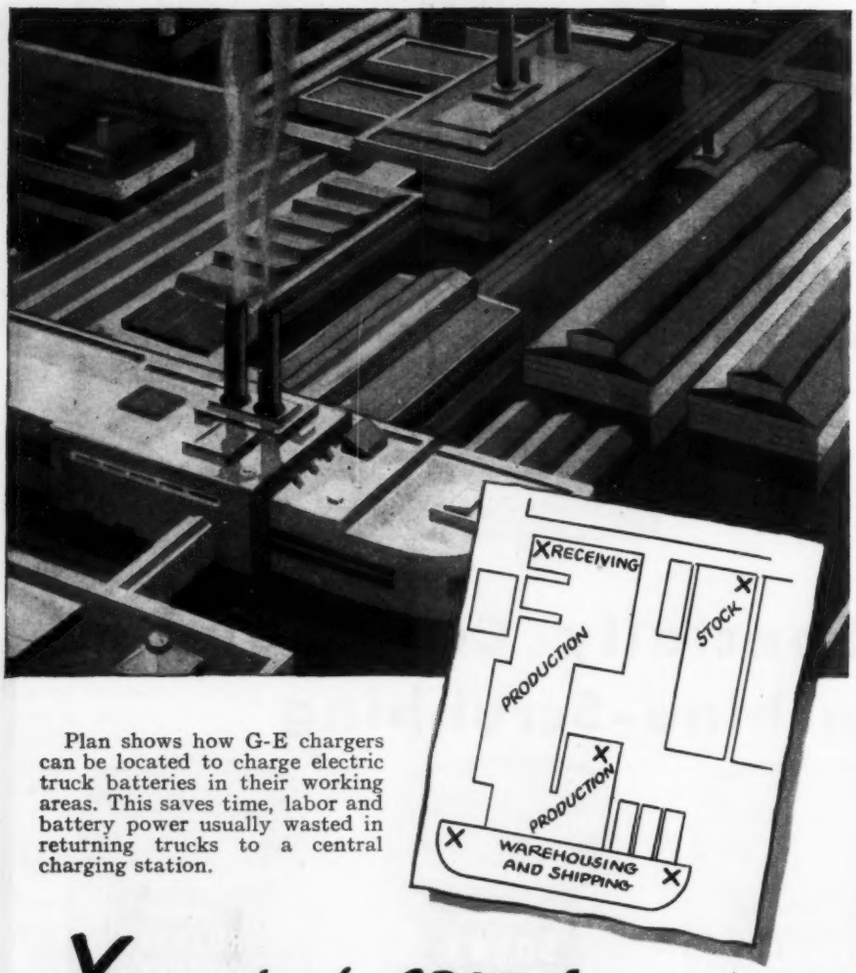
All *Finnell* Cleaning Powders are compounded to give cleaning action compatible with the speed of machine-scrubbing. They act *instantaneously* on dirt, oil, and grease, so that your scrubber can remove the accumulation in minimum operating time. All *Finnell* Powders are compounded in *Finnell's own powder mill*, and containers range from 5-lb. bags to 300-lb. barrels. For consultation or literature, phone or write nearest *Finnell* branch or Finnell System, Inc., 2511 East Street, Elkhart, Indiana. Canadian Office: Ottawa, Ontario.

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

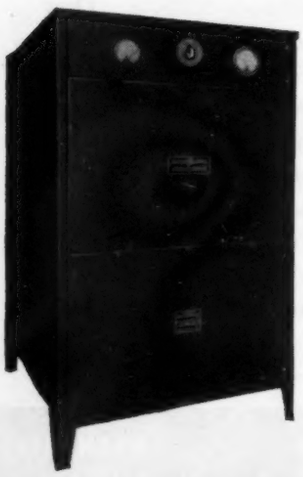
BRANCHES IN ALL PRINCIPAL CITIES



Plan shows how G-E chargers can be located to charge electric truck batteries in their working areas. This saves time, labor and battery power usually wasted in returning trucks to a central charging station.

X marks the SPOT for a G-E BATTERY CHARGER

Gone are the days when it was necessary to ship electric trucks to a central charging station after long hauls or a hard day's work. Now you can charge batteries in truck working areas by simply "spotting" G-E Copper-oxide battery chargers at strategic locations where they are always ready to do a job. The savings in time, labor and battery power are obvious.



The charger is easy and economical to use. It's fully automatic so—all a user has to do is plug in the connections, turn on the switch and the charger does everything else. It shuts off automatically on completion of the charge and a built-in control prevents batteries from discharging back through the charger after the a-c current turns off.

There are G-E Copper-oxide chargers for lead-acid batteries, nickel alkaline batteries or combination chargers to accommodate both. G-E chargers have no moving parts other than the cooling fan hence, maintenance costs compared with other types of battery charging equipment are negligible. For full details write: Section A1156-37, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

return for wage increases and embodied in a collective bargaining contract, will not bar subsequent action on the part of the individual to reassert his right to the unpaid overtime compensation. Since there was no dispute in the particular case as to coverage or the amounts of overtime due, the court took the position that the agreement was nothing more than a waiver of wages under the Act and therefore unenforceable. The court pointed out that the right to overtime is an individual right which cannot be bargained away by the union. Moreover, to determine how much of the increase was for unpaid overtime and how much was caused by economic pressure would be impossible. (Watkins vs. The Hudson Coal Company, CCA-3)

Held Time Worked

Time spent by piece-rate employees in cleaning and oiling their machines, and time spent outside their regular working hours in sorting and attaching work tickets to record sheets used by their employers in making up the payroll. The court, basing its decision on the definition of time worked by the Supreme Court in the case of underground travel time of miners, deemed immaterial the fact that the time so spent is not directly productive, hazardous, or performed under the immediate supervision of the employer. The court pointed out that the time so spent was for the benefit of the employer and therefore should be compensable. (Walling vs. Frank, USDC W. Ky.)

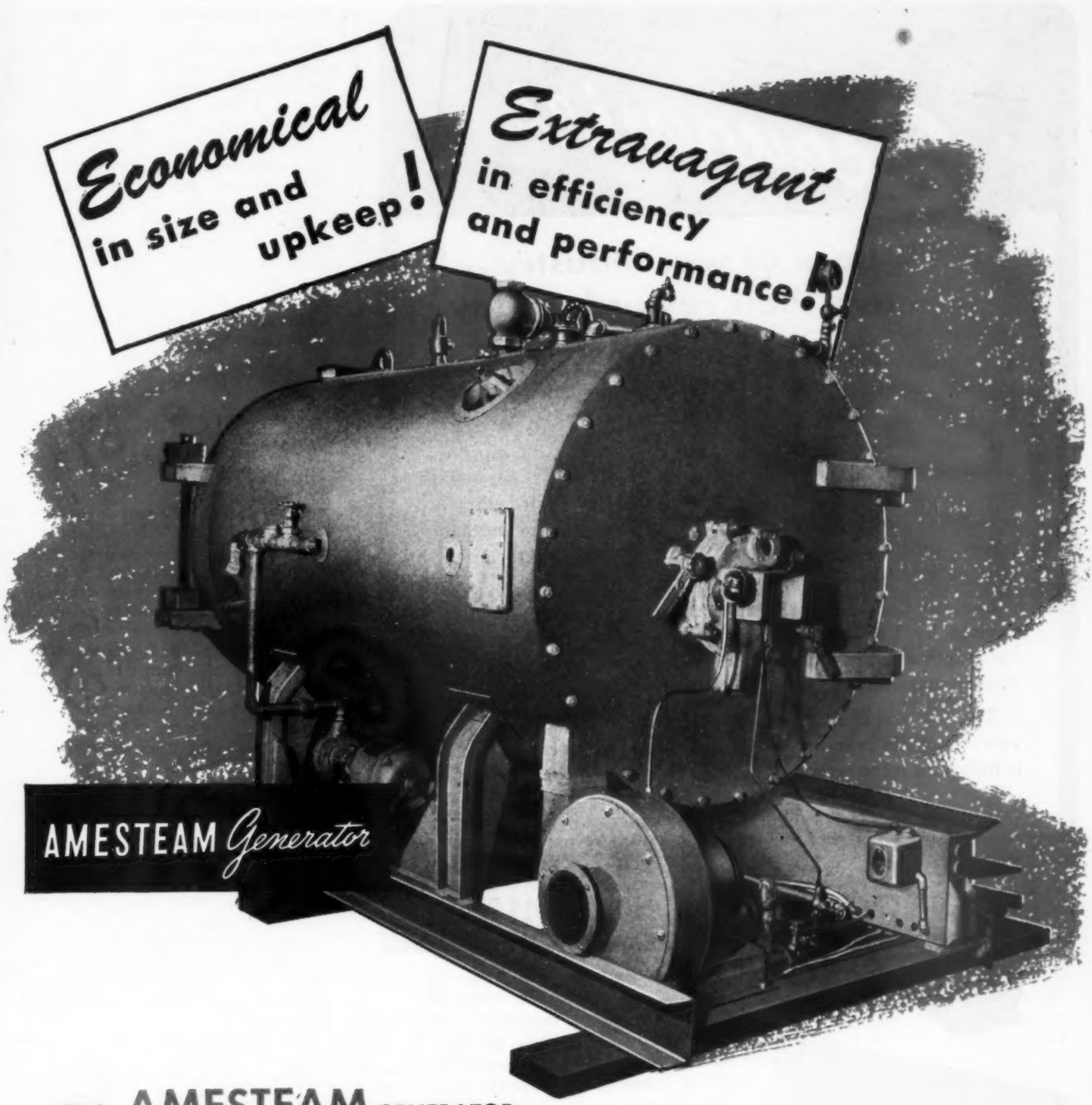
Travel time of longshoremen both to and from the hiring hall to the dockside. The need for travel time pay arose from the fact that the hiring halls were not close to the port area to which the longshoremen had to report to work. In one area, the employers were awarded the right to a branch hiring hall nearer the place of work, so that the travel time costs could be minimized. (Waterfront Employees Association, WLB)

Held Under the Act

Corporation which is engaged in the business of leasing or renting automobile trucks and passenger cars on a "drive it yourself" basis for intrastate and interstate use. The court held the entire employee staff under the Act since the employer made no distinction in his operations and between those vehicles to be used for interstate business and those which were not. (Hertz Drivurself Stations, Inc. vs. U. S., CCA-8)

Truck drivers and helpers of a local trucking firm transporting goods for ladies' garments to and from manufacturers and contractors within the New York City garment center and across state lines. The court deemed their work within Section 3(j) of the Act, which covers "every step in putting the subject of commerce in a state to enter commerce." (Walling vs. Comet Carrier, CCA-2)

Employees of a common carrier by motor vehicle, less than 1 percent of whose business is in interstate commerce but 95 percent of whose business is transporting un-



THE AMESTEAM GENERATOR combines all the features any engineer wants in a power plant.

Its space requirements are small, yet it is a completely self-contained, compact package of power in units ranging from 10 to 300 horsepower. It sets up in a matter of minutes, and performs flawlessly year after year, with automatic precision that keeps manpower needs at a minimum.

And it is easy to get at, if repairs are ever required, so that as little time as possible is lost in your plant!

Backed by Ames' 100 years of experience, the AMESTEAM GENERATOR deserves the immediate attention of any plant which requires speedy and reliable steam service at low cost. Phone or write our engineers today for full information.

AMES IRON WORKS
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Economies

born of war industry... have their rewards today

● Fearful of being "too late with too little," American industry won its race against time. Quantity and quality surpassed the hopes of all but the most courageous and progressive.

One of the contributing factors to victory was the *general advancement in mechanical materials-handling,* and most particularly in routing materials in process through successive stages of manufacture. Substantial savings in manpower, time and costs accrued. Production consistently increased, meriting a steady flow of "E" awards.

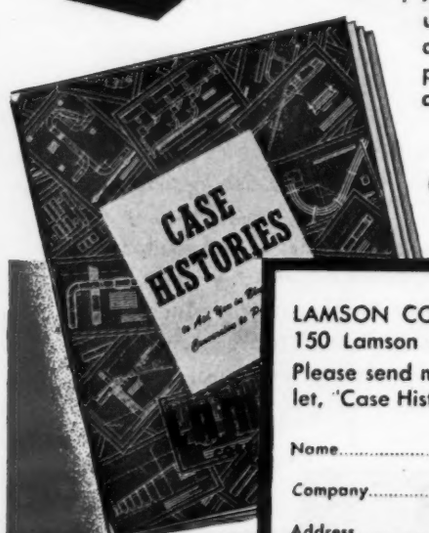
Lamson Conveyors, through many ingenious applications, devised by Lamson engineers, showed industry throughout the length and breadth of the country, new speeds and economies in materials-handling.

The rewards of Lamson achievement are now available to you . . . and in practice are essential to the competition which is following reconversion.

To assist you in today's planning, we'd like to send the

FREE BOOK "CASE HISTORIES"

● It will aid you in blueprinting conversion to peacetime conditions . . . come inside some of America's greatest industries with us . . . and see how they will handle the problems of increased output at lower costs. Write for your copy today.



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150 Lamson St., Syracuse 1, N. Y.
Please send me a copy of your reconversion booklet, "Case Histories".

Name..... Position.....
Company.....
Address.....
City & Zone..... State.....

finished products between plants manufacturing articles which are to be sold in intrastate and interstate commerce. (Walling vs. Griffin Cartage Company, Inc., USDC E. Mich.)

A laundry servicing exclusively linen supply companies which rented articles to their customers, one of which was out of state and supplied 10 percent of the laundry's gross business, on the ground that the laundry is engaged in producing goods for commerce. Thus, an employee who operates the laundry's steam and power plant is entitled to the benefits of the Wage-Hour Law. (Koerner vs. Associated Linen Suppliers Laundry, Inc., N. Y. Sup. Ct.)

WAR LABOR BOARD

* *Wage Adjustments Permitted Without Approval*

For cases affecting the cost of goods to the government, the WLB has been empowered to raise employees' wages working for employers under contract with a federal procurement agency on the basis of the Little Steel formula, substandards brackets, the "rare and unusual" doctrine, and the "fringe" directive, without submitting such adjustments to the Office of Economic Stabilization for approval. The contractor, however, retains the right to appeal to the director for review of the board's order. All other adjustments, particularly those involving the transition to a peacetime economy, must be submitted to the Economic Stabilizer for approval before they can be put into effect.

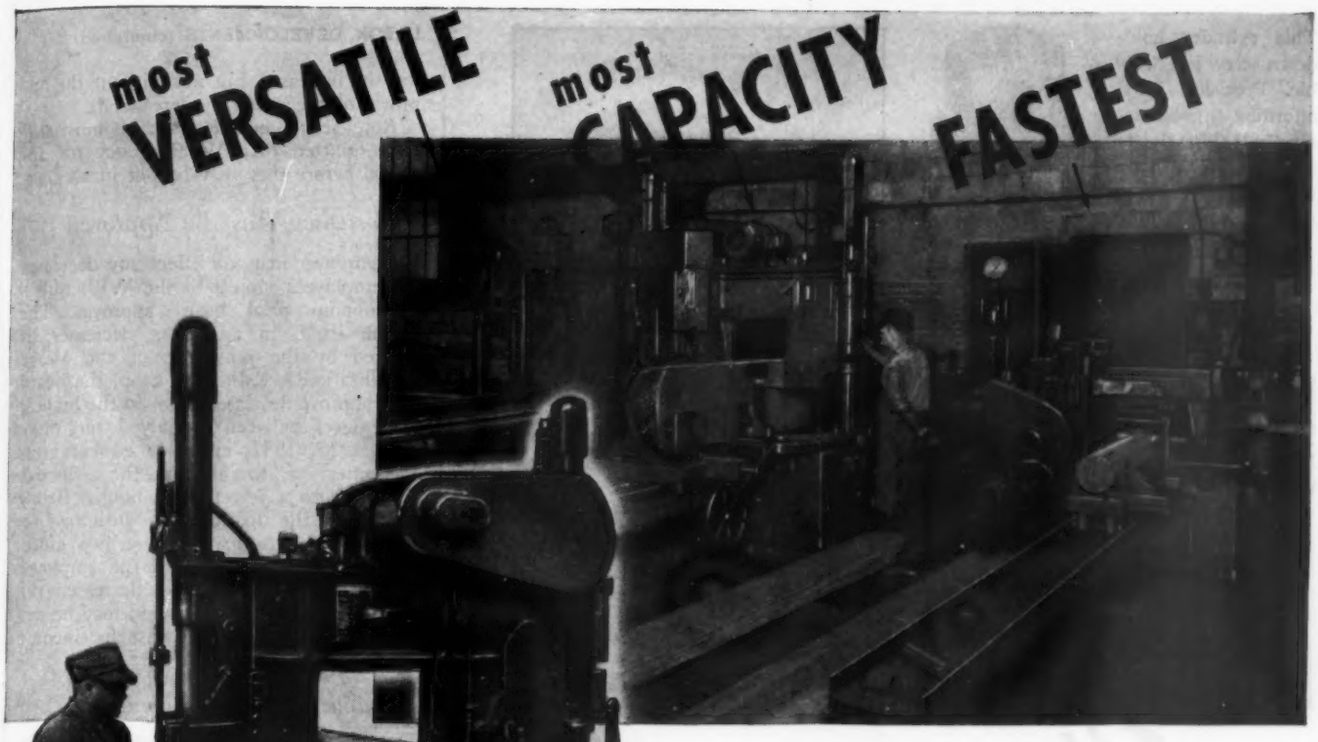
General Orders Nos. 4 and 12-B have both been repealed. The former exempted employers of less than 8 employees from wage control, while the latter related to wage and salary adjustments by state, county, and municipal governments and agencies. This means that wage adjustments made by such employers must be approved by the WLB *if price ceiling relief is involved.*

The employer may, however, increase wages and salaries up to 55 cents an hour without approval, even though price relief is involved. Moreover, no approval is required for increases required by law except for increases beyond 55 cents an hour required by state law or order promulgated after April 8, 1943, where price ceiling relief is involved.

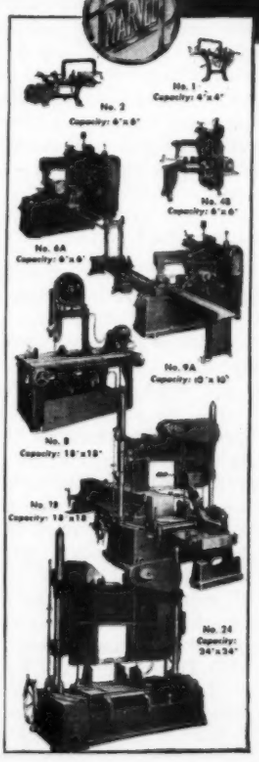
* *Union Approval Required for General Increase*

An employer must have union approval in granting a general across-the-board increase pursuant to General Order 40, if there is a union in the plant. Individual merit, length-of-service, or reclassification adjustments effected, however, need not have union sanction. Thus, the employer may freely give as many individual increases as he wishes provided he does not exceed the maximum of the rate range. The latter

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.



EACH *first* IN ITS CLASS



AT the Braeburn Alloy Steel Corporation, Braeburn, Pennsylvania, there is a lot of steel to be cut—not only in tonnage but in types of steels, variety of cuts and range of sizes. Still the Braeburn Corporation can give prompt cutting-off service on any order, whether it be for a single tool steel flat, a thousand gear blanks or a giant die block (up to 18″ x 18″ cross section). They have equipped their cutting-off department to handle every type cutting-off job with a MARVEL No. 8 Metal-cutting Band Saw, by far the most versatile saw built; a MARVEL No. 9A Automatic Production Saw, by far the fastest saw; and, a MARVEL No. 18 Giant Hydraulic Saw — which, with the exception of its larger "sister" the MARVEL No. 24 (capacity 24″ x 24″), is the largest capacity hack saw built. With this battery of modern sawing equipment this firm gets the utmost in Speed, Accuracy and Economy, no matter what the job calls for. Furthermore, because of the automatic features of these saws, one operator takes care of all 3 of them.

No matter what your sawing needs, from the most inexpensive dry cutting shop saw to the largest capacity giant, there is a MARVEL Saw exactly suited to your needs and it's the best saw of its type.

For quick reference see our section in Sweet's File—Mechanical Industries, or write for catalog

ARMSTRONG-BLUM MFG. CO.

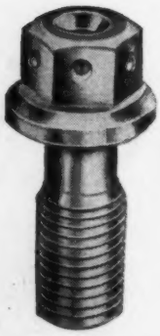
"The Hack Saw People"

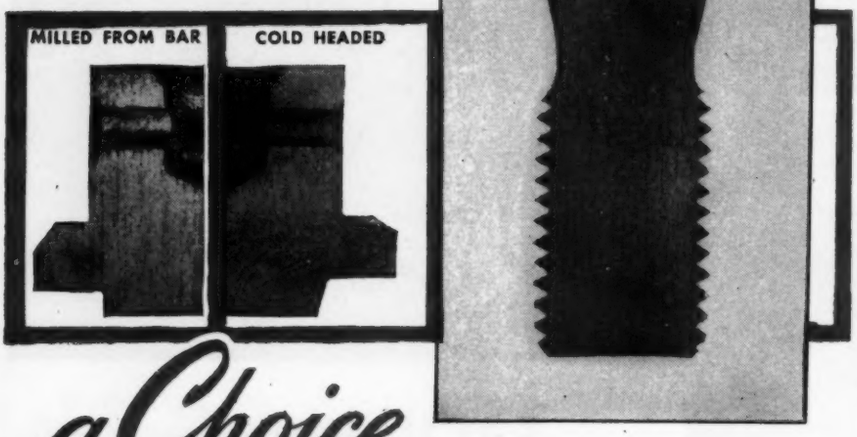
5700 W. BLOOMINGDALE AVE. **CHICAGO 39, U. S. A.**

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

This cylinder hold-down screw is a Corbin Precision Part, affording a good example of intricate cold heading. Notice the flow lines in the microphoto.





a Choice of Primary Operations

Milled-from-bar or cold-upset? Corbin can do it either way . . . for Corbin facilities include a complete battery of modern cold headers capable of upsetting products from wire 1/16" in diameter to 1/2" diameter body size, with upset sections and extruded shanks as may be required. Tolerances as close as .002" on body diameters can be maintained. Special heading equipment, such as double end headers, rod headers, hand headers, and reheaders, is available for specialized production.

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See Sweet's Product Design Catalog, outline of Corbin Products and Facilities

Precision Parts

LABOR DEVELOPMENTS ***(continued)***

may be increased, but not without the approval of the union if there is one.

Rates set for new departments must still be submitted to a WLB agency for approval before they may be put into effect.

* *Decreases Must Be Approved*

An employer *may not* effect any decreases for employees subject to the WLB unless he obtains prior board approval. The board, itself, in approving decreases, is limited by the provisions of the Wage Stabilization Act. In some cases, the board may approve decreases down to the highest wage level between January 1 and September 15, 1942, either to correct gross inequities or to aid in the effective transition to a peacetime economy. Below this level, the board might authorize reductions if necessary for the two aforementioned reasons. Should the employer institute an unauthorized decrease, the *total* sum of illegal wages paid may be disallowed as a business expense for income tax and other purposes.

* *Stabilization Enforcement*

Despite the relaxation of wage controls, the WLB will continue its enforcement proceedings against all employers who are paying illegal wages and salaries. Regional boards are instructed to follow their existing enforcement policies; however, illegal rates will not be rolled back to legal levels since there is no longer any limit on wage increases. No new violation cases will be instituted unless in prosecution for violation of remaining wage stabilization controls, development of evidence, or voluntary disclosures of violations.

* *Fringe Increases Permitted*

Fringe adjustments or non-basic wage adjustments as well as wage increases awarded under arbitrator awards may be made without WLB approval, provided they do not depend on price ceiling adjustments or increase the costs of goods to the United States as a contractor. Into this category fall such awards as night-shift premiums, vacations, lunch and supper pay, call-in pay, holiday pay, etc.

* *Wage in Lieu of Overtime*

The recent "in lieu of" policy manifested in several board decisions is now applied to the milk industry. The employees of New York-New Jersey milk industry were awarded compensatory wages "in lieu of" overtime pay and night-shift premiums to which they would be entitled if it were not for the peculiar characteristics of the industry. The board recognized the need for a 48-hour work week in the industry, and, to balance the demands of the union for a 40-hour week and the need of the company to have its employees on duty 48 hours a week, it awarded a weekly increase of $2.50 to all inside employees and $1.50 to all outside employees in lieu of overtime payments and shift premiums. (New York, New Jersey Milk Distributors, WLB)

Minimum Pay Award

An award of 45 cents minimum wage to

★

When the Atomic Bomb hit Taylor's...

THE Atomic Bomb landed on American industry long before it devastated Hiroshima and Nagasaki. Maybe it hit you harder than it hit us. All we know is that here at Taylor Instrument, it had an impact not only on our own organization, but on our suppliers and our customers. Here is what happened:

On a spring day in 1943, the War Department called us in to ask us if we would assume the responsibilities of prime contractor on process control instrumentation for the Kellex Corporation for a secret project called the "Manhattan District." As everybody knows now, this was the Oak Ridge Atomic Bomb Project.

We were already supplying instruments to eleven major branches of the armed forces. Commitments to the super-critical synthetic rubber, 100-octane gasoline and chemical industries programs imposed heavy responsibilites. On top of this, war industries' needs were increasing. Materials were scarce and manpower scarcer. But we were told this was an opportunity to help shorten the war. So of course there could be but one answer.

Our responsibilities included the development, design and production — in unprecedented quantities — of a score of new types of instruments, involving new principles, and closer operating tolerances than had ever before been required of process control instruments. In addition, we were asked to loan a number of our top engineers and technicians to the project.

Our production schedules had to be overhauled. Directives over-rode high-rated war orders. Civilian orders stood at the far end of the line. But the problems were solved, because thousands of people in our plants and in those of our subcontractors devoted their whole time to the project to the extent of seven days a week, month after month.

Naturally, we're proud of the way our organization came through. But we're proud too of our many, many customers who showed patience and understanding in the face of temporary delays in delivery for which we could only offer phoney-sounding excuses. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. *Taylor Instruments mean "Accuracy First."*

A CONVEYOR SYSTEM engineered by Alvey-Ferguson is virtually an endless-stream *indoor* transportation system that can take raw materials in one end of your plant and turn them out as finished products—shuttling them to storage banks or to and through the shipping rooms—even stacking them in box cars if you wish.

The A-F Chain Conveyor, shown above, handles heavy cast alloy boxes of stampings from the annealing furnace. It is only a small section of the *complete* A-F Conveyor System in a mid-western plant which enables operators to handle greater production with less effort—less fatigue—more efficiency.

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LABOR DEVELOPMENTS *(continued)*

employees of telephone exchanges servicing less than 500 stations by a WLB agency, despite the fact that such exchanges are exempt from the Wage-Hour Law, brought forth a vigorous dissent from the employer members of the agency. The latter contended that the decision was illegal since the War Labor Disputes Act requires the board to conform with the Wage-Hour Act. The majority pointed out that the Act does not bar such an award, since it does not prohibit the establishment of wage rates more liberal than those prescribed in the Wage-Hour Law. (Upstate Telephone Company, National Telephone Commission)

* Vacation Awards

By virtue of a RWLB decision, employees who resigned or were discharged for cause after qualifying for a vacation were deemed entitled to claim their accrued vacation pay at the time they left the company. The award was motivated by the fact that many employees did not receive a vacation until many months after they qualified for one, so that some employees would forfeit their vacation rights if they left before receiving them. (Atlas Powder Company, RWLB-VII)

In another case, veterans having six months' service with a company before induction into the armed forces, and on the payroll again on the eligibility date for a vacation, were awarded the right to vacations and pay on the basis of their accumulated seniority with the company, including time spent in service, irrespective of existing contractual requirements. (Big Four Brass Company, RWLB-I)

* Vacation Pay

Employees qualifying for vacation on the basis of seniority, but failing to meet other requirements because of recent cutbacks, were granted one-half their regular vacation award by the WLB. Those employees who were downgraded during cutbacks were awarded vacation pay computed at their higher rates before the cutback. The board, in making its decision, claimed that such was the company's practice at the time it converted to wartime production. (General Motors Corporation, WLB)

* Severance Pay Denied

The union's request for severance pay in an aircraft plant was denied by the WLB in accordance with its belief that such pay should be adopted in the industry only by voluntary agreement of the parties or by appropriate legislation. Although it recognizes the severe financial losses incurred by the workers in layoffs, the board points out that the employees were aware of the temporary nature of their jobs. (Consolidated Vultee Aircraft Corporation, WLB)

* Promotion Plan Not to Be Altered

WLB refused to alter an existing plan for company-union determination of employees' qualifications for promotion so that the determination would lie completely with the company. The company contended that it was compelled to permit a senior employee to work in a new

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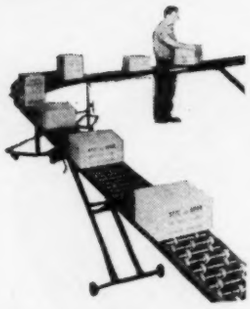

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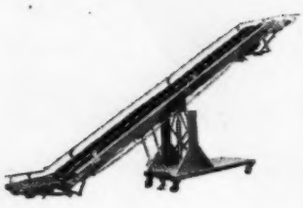
A flexible gravity conveyor that is finding ever-growing use solving material handling problems in all types of industries. Sturdy and lightweight, it can be set up quickly, operates smoothly and easily. Available in eight standard models, depending on width and number of wheels per foot.



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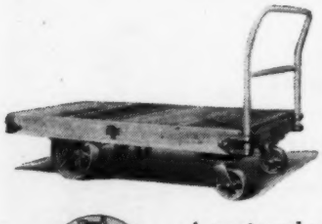

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classification to prove his incompetence. The board, accepting the union's argument, declared that the company's position was adequately protected by provision in the plan for arbitration in case of dispute. (New York, New Jersey Milk Distributors, WLB)

* *Seniority Where Veteran Did Not Work*

Granting, in effect, extra-legal rights to a veteran, a RWLB ordered a company to credit honorably discharged veterans who had not been in the company's employ before induction into the services with seniority equivalent to their service time after the veteran had completed a 30-day trial period with the company. (J. H. Williams & Company, RWLB-II)

NATIONAL LABOR RELATIONS BOARD

* *Do's and Don't's for Pre-Election Conduct*

The fact that the employer continues to deal with the union pursuant to the grievance procedure of an expired contract during a pre-election campaign, is not an unfair practice. In one case, the same privilege was extended to the members of a rival union, which did not seek the privilege. Furthermore, the employer need not deny untrue statements or inferences circulated by the contracting union that he was negotiating with it before the election, and had reached an agreement on a matter excluded from the old contract. However, the employer may not legally discharge employees in accordance with a maintenance-of-membership clause in the expired contract, since the clause is no longer in effect. (Phelps Dodge Copper Products Corporation, NLRB)

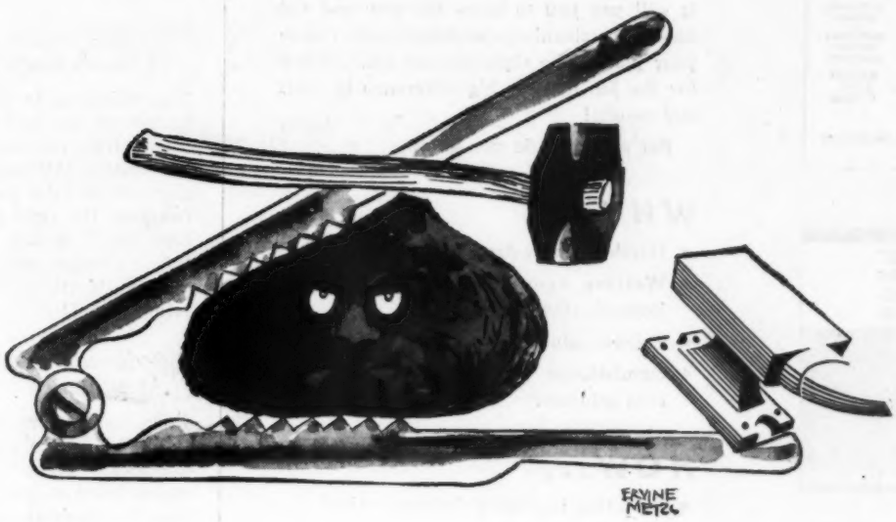
* *Striker Held an Employee and to Have Right to Vote*

The fact that strikers accept temporary employment with another employer while a strike against their own employer is taking place, does not deprive them of the status of "employees" and the right to vote in an election. The NLRB rejected the employer's contention that, since the employees had used USES for referral and could be reinstated only through action of the USES, their employment with him had terminated. (Norris, Inc., NLRB)

* *Immunity of Labor Union Officials Under Closed-Shop Contract*

Immune from prosecution under the Federal Anti-Kickback Act are union officials under a closed-shop contract pursuant to which they approve for construction jobs, on a federally financed project, only union members, or persons making payments out of their earnings for union fees, as a condition of their employment. The court, pointing out the distinction between unions and employers or employers' representa-

QUICK QUIZ:



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Preventing surface film of moisture on metal parts, causing corrosion?

Eliminating errors in "miking" which result from changing air temperatures?

Etching of finished surfaces caused by perspiration on hands?

Eliminating air-borne dusts that scratch polished surfaces?

Obtaining high employee efficiency and morale with controlled indoor air?

Maintaining a quiet, dust-free drafting room, free from outside noises and winds?

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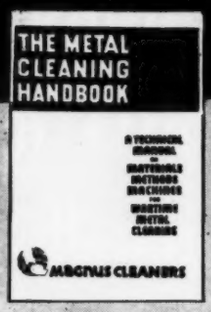
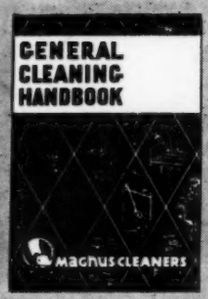
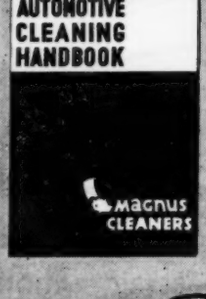
THE *WHY* AND THE *HOW* OF *CLEANING*







It will pay you to know the why and the how of the cleaning operations carried on in your plant. The right cleaner and method for the job make a big difference in costs and results!

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WHY...

- Harsh cleaners damage floors?
- Wetting agents speed cleaning and improve rinsing?
- Caustic solutions are poor cleaners?
- Emulsifiable solvent cleaners work in cold solution?

HOW...

- Agitation improves cleaning action?
- Cleaning tinned equipment can be done safely?
- Sludge can be controlled in heavy fuel oil?
- Cement floors are cleaned, whitened and hardened?
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tives, declared that the union's power in this case did not constitute an employer's authority but was a power arising from a collective bargaining agreement which is within "the legitimate objectives of trade unionism." (U. S. vs. Carbone, USDC Mass.)

* *Election Not to Be Delayed Because of War's Ending*

Uncertainty as to the status of employees because of the end of the war is not sufficient reason to delay a union election indefinitely. Although the board orders an election to take place, it does give the company the right to appeal the certification based on the election in the event future changes affect the character of the unit involved. (Curtiss-Wright Corporation, NLRB)

* *Redetermination of Bargaining Agent Barred*

Premature renewal of a 3-year contract was deemed a bar to a redetermination of the bargaining agent where the challenging union failed to give notice of its claim before the expiration of the old contract. The NLRB declared that the 3-year period was not unduly long, inasmuch as industry practice was similar. (U. S. Finishing Company, NLRB)

* *Parties Not Permitted to Drop Case*

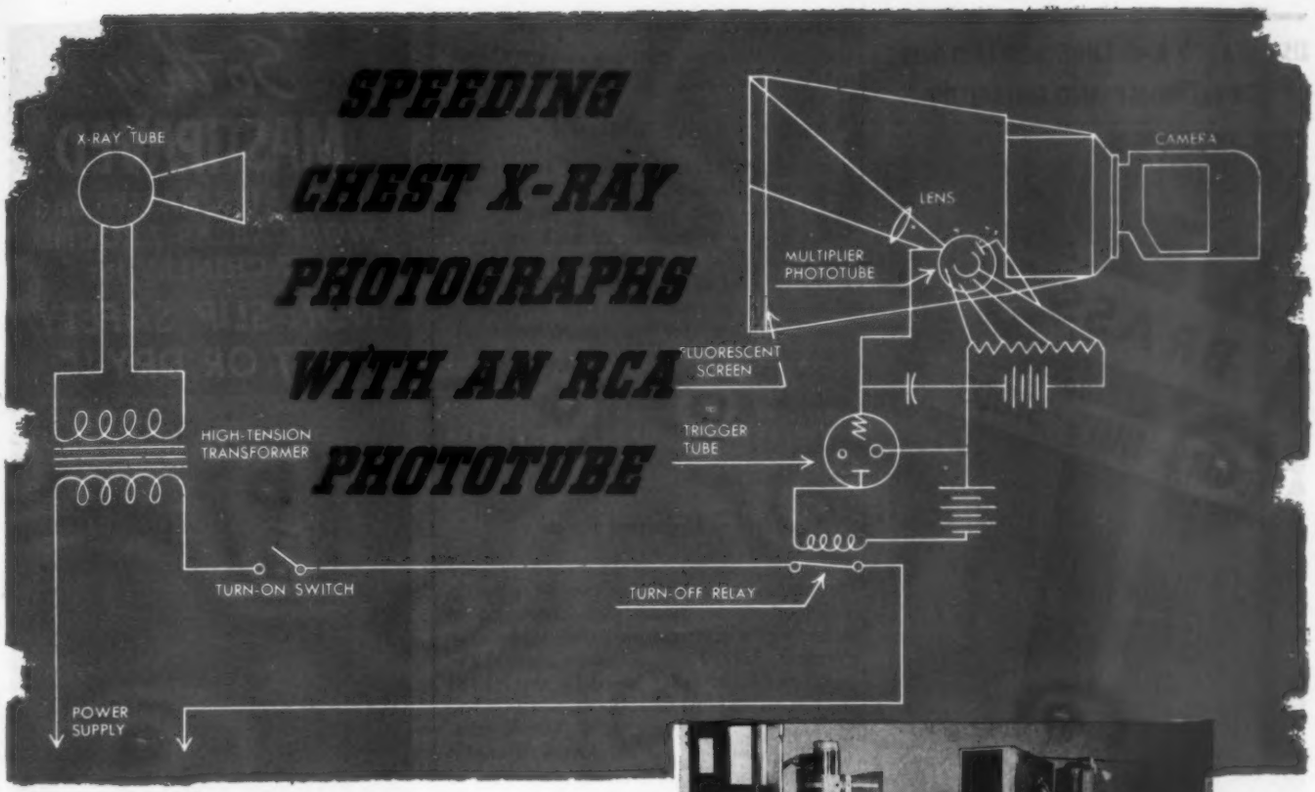
Following the NLRB's policy, a state labor relations board refused to allow the parties to arrange among themselves the dismissal of a complaint entered with the board in an unfair labor practice case. The board declared that first it must be satisfied that the parties have adhered to the law before it will consider dropping the case. (Bookbinder's Restaurant, Inc., Pa., NLRB)

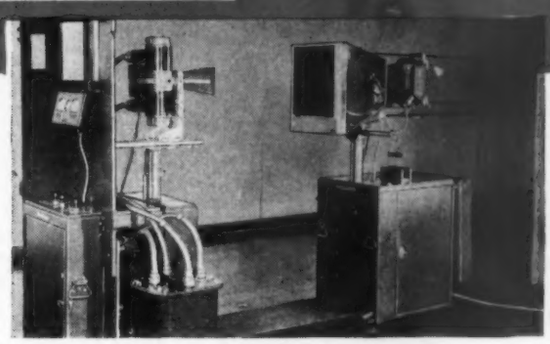
* *Reinstatement With Back Pay Ordered*

The discharge of several union members, allegedly in keeping with the closed-shop contract of another union, was deemed discriminatory by the NLRB, inasmuch as the discharged workers were members of a separate and distinct bargaining unit, not covered by the closed-shop contract. The board pointed out that the contract especially excluded such workers, since they have always been represented by a separate unit. In addition to which, inclusion of these employees, who were highly skilled machinists, in the same bargaining unit would be violative of the Wagner Act, since a unit including both production and maintenance employees covered by the contract, and the skilled employees in question, would be inappropriate. (Graham Ship Repair Company, NLRB)

Resignation of a union member from the employer's payroll constituted a discriminatory discharge where the employer induced the resignation by criticizing the employee's work, whether right or wrong, subjecting her to the supervision of a newly hired employee, and holding her liable for back work accumulated because of the employer's failure to replace a resigned em-

SPEEDING CHEST X-RAY PHOTOGRAPHS WITH AN RCA PHOTOTUBE





Picker *Minograph* and Automatic Chest-Survey Unit uses RCA electron tubes to time X-ray exposures automatically

The Problem: A major bottleneck in chest X-raying technique was the measuring of the thickness of the body and guessing at density so as to get properly timed exposures. Each variation in body thickness or density required different settings of the controls. The quality of the picture was seldom uniform; the method was slow.

The Electronic Method: In the Picker X-ray unit, exposures are controlled automatically, the electronic way, from a single push-button; all body measurements and density determinations are eliminated. Excellent pictures result from each exposure with this new method, at a rate of more than 3 a minute.

How It Works: As X-rays pass through the body, they illuminate a fluorescent screen in direct proportion to the amount of X-radiation penetrating the body. The X-ray image is photographed on miniature film directly from the fluorescent screen. An RCA-1P21 phototube picks up light from the fluorescent screen. The amount of light necessary to operate the phototube is exactly the same as that required for a perfect photographic negative. Operation of the phototube triggers an RCA-1C21 gas triode, which trips a relay to shut off the power in the X-ray machine at the correct exposure interval.

Advantages: Speed, uniformity of exposure, and simplicity of adjustment for each new picture, are advantages for large X-ray clinics. Moreover, the machine makes it possible for any doctor, hospital technician, or other X-ray user, to take X-ray pictures of professional quality.

Other Applications of Phototubes: Phototubes, in conjunction with other RCA tubes, are performing innumerable automatic operations—such as counting, inspecting, sorting, measuring temperature, controlling lights, operating alarm systems, detecting fire and smoke, etc.

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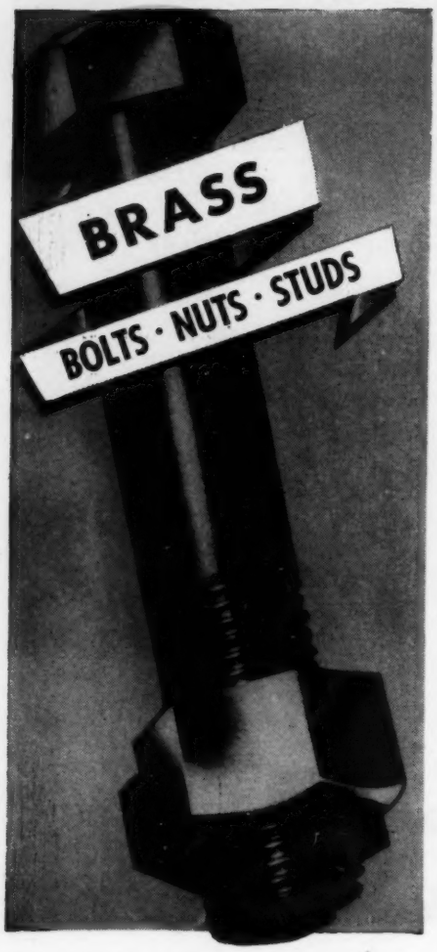

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LABOR DEVELOPMENTS ***(continued)***

ployee. (Palm Beach Broadcasting Corporation, NLRB)

** Back Pay Order Sustained*

Lack of good faith in offering to reinstate two discriminatorily discharged employees was held grounds for denying an employer relief from the payment of back pay from the date of the offer. The employees had accepted jobs in an essential industry after their discharge and were under the impression that they were not legally free to return to their original employer. The board found that the employer had proffered reinstatement with the full expectation that employees would not and could not accept. (Litchfield Manufacturing Company, NLRB)

** Association Enjoined From Interference*

An employers' association may be properly enjoined from aiding the employer in achieving objectives unlawful under the Wagner Act. Thus, the court upheld the cease-and-desist order issued by the NLRB against an employers' association which had attempted to interfere with the organizational attempts of the employees of one of its members. The association was found to have conducted a campaign to preserve the open shop and had expended funds in hiring organizers to form inside unions under employer domination. The court held that the board is not limited to restraining the acts of the particular employer but also could extend its power to the "future violations as to other employers." (NLRB vs. Sun Ten Lubbert Company, CCA-9)

** Held Discrimination*

Discharge of a union organizer on the ground that he requested a salary increase and admitted he could not live on the salary he was receiving was deemed discriminatory by the NLRB. The employer's contention that the discharge was motivated by the employee's inability to live on the salary was rejected in the face of a supervisor's admission that the employee's discharge was caused by his union activities. Moreover, no such reason had been used ever before as the basis of a discharge. (Chase National Bank, NLRB)

** Held Unlawful Refusal to Bargain*

Although the usual procedure for contesting a union's appropriateness is a refusal to bargain with that union, lack of good faith in so refusing may result in an unfair labor practice charge. In one case, the employer refused to bargain unless the clerical employees were excluded and the union kept him informed of its prospective demands. The board, rejecting the employer's contention that the refusal to bargain was based on the fact that he had received no evidence that his employees were properly organized, found him guilty of an illegal act. It pointed out the law prescribed no set method which must be followed by employees in organizing; that they may use any method they wish for such purpose. (Palm Beach Broadcasting Corporation, NLRB)

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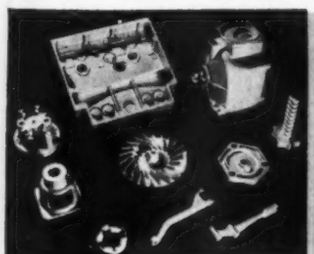

Die casting magnesium is an accepted method of producing lightweight parts with good surfaces and close dimensional tolerances.

Preheated magnesium sheet is readily deep drawn in a single operation, without need for repeated annealing and redrawing.

Sand and permanent mold castings of magnesium are known for their exceptional combination of lightness, soundness, strength.

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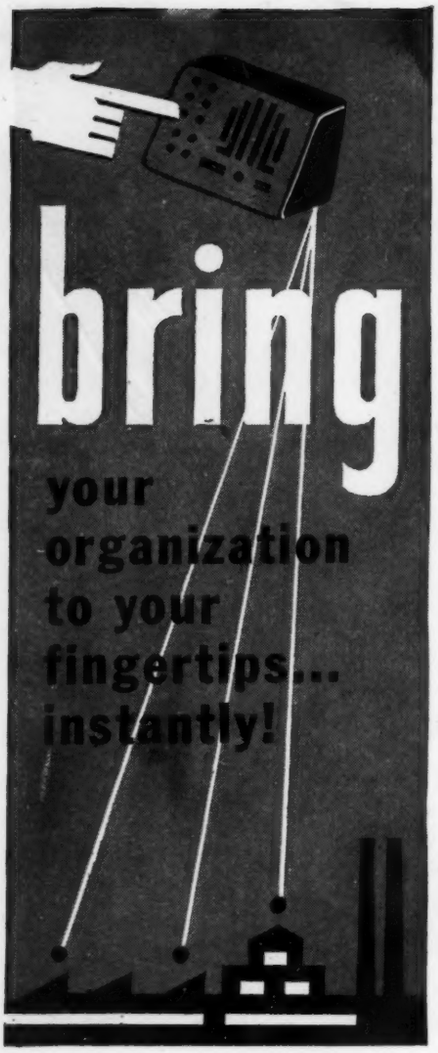

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THEY SAY AND DO

Implications of Decentralization

RALPH J. CORDINER, Vice-President and Assistant to the President, General Electric Company, New York, before General Management Conference, American Management Association.

The growth of every business venture is an evolution of methods and men. This process is accelerated in periods of extreme economic change, such as we are now witnessing, and management must then determine its objectives and the changes required to attain them. As a case history . . . I am going to speak to you of the General Electric's recent step in this evolution of decentralization.

General Electric originated through the merger of certain companies and the subsequent purchase of other firms. These original companies or those acquired had established manufacturing facilities in communities like Schenectady, Pittsfield, Lynn, Fort Wayne. At that early date, the population of those communities was ample to serve the employment needs of not only our company but also of other industrial firms. There was no definite pattern or plan, and over the years, as the business expanded and new manufacturing facilities were acquired, the additions were located in these same small communities. It became apparent, not only in the late 30's but also in the war period, and now continuing into the post-war era, that the company's requirement for employees would in all too many instances represent 60 percent of the total industrial employment in those areas. This is not desirable for the community, and certainly not for the company.

Again, like other companies, our post-war plans project a business more than twice the size of our average pre-war volume, indicating a prompt need for additional manufacturing plants.

The procedure of unloading manufacturing operations from these concentrated and congested areas is two-fold: First, establishing satellite plants within an area of 100 miles of the presently existing main factory; and, second, moving an entire operation and reestablishing it in a new area, utilizing a new labor market, and associating the company with the economic life of a different state.

The second kind of decentralization now in effect at General Electric is that of top management itself. Early this year, operations were divided into seven general management areas, each under an executive responsible to the president.

The obvious reason for management decentralization was that increasing size and complexity were creating a demand for such increased variety and volume of decisions and directions that the decisions had to be closer in each case to the scene of the problem for complete understanding and prompt action.

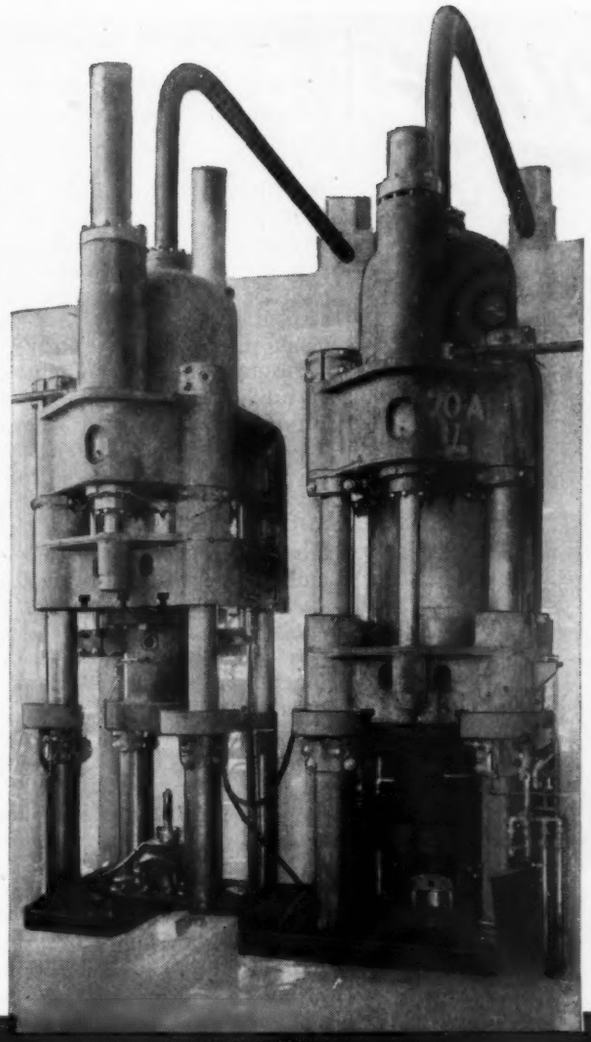
Another reason was that for some years size had been argued in some quarters as an evil in itself, and this despite the fact that many of the most important advances in standard of living and healthful well-being so obviously came as the result of the combined strength, experience, and integrity of large institutions. . .

Better Values Demanded

Another reason for decentralization at this time has been the realization of the entirely new demand—in sudden proportions never before experienced—for an advance in the value offered the customer that will be so attractive as to double or triple past consumption and yet be at a price within which have been included the usual expenses plus an unprecedented extra labor and tax cost. There is grave question in the minds of all of us, I am sure, as to whether the public expectations of high pay and low prices can be satisfactorily met. . . Decentralization, accompanied, we hope, by specialization and individual concentration, is one measure General Electric is taking to exhaust the possibilities of giving the bigger value required under this competitive situation.

Finally, decentralization is looked upon as an aid in achieving a shift in management to match another shift in management's problems. . . In the belief that the personal problem—or opportunity—is a series of intimate, personal, local cases, we are looking to decentralization to establish top management closer to the employee.

Having for these reasons decided to decentralize, General Electric divided top management among six operating departments for the company proper, and a seventh for the wholly owned affiliated manufacturing companies. The considerations determining the assignments among the seven were common services to individual classes of customers, common engineering problems, natural groupings of manufacturing facilities and of products, and other appropriate management



IT'S VIM 20 to 1-

COMPRESSION PACKINGS WORE OUT IN ONE WEEK!

VIM Leathers lasted 5 months plus!

Piercing presses for 105 mm. H. E. shell forgings, exerting a pressure of 1260 PSI, had been equipped with ordinary compression packings. Each week the packings had to be renewed—with down-time loss and high upkeep.

The contractor changed to VIM Leather "V" Packings recommended by our hydraulic engineers. The first press so packed ran *five months* without a packing failure; had not production been halted on V-J Day, it might still have been running.

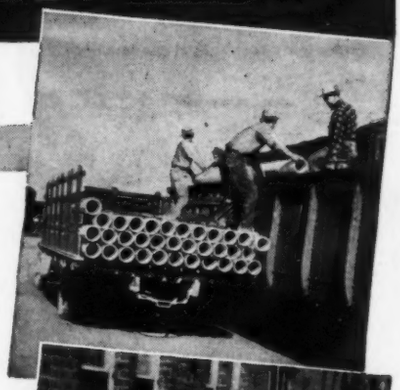
Meanwhile all other presses in that huge installation were being changed over to VIM Leather Packings, which were providing long, trouble-free service.

Twenty times the life of other type packings is not too unusual for VIM. These moulded leathers, designed right, made right, and engineered for the job, can well be the answer to *your* packing problem. Write E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa.

HOUGHTON'S *Engineered* **VIM** *Leather Packings*

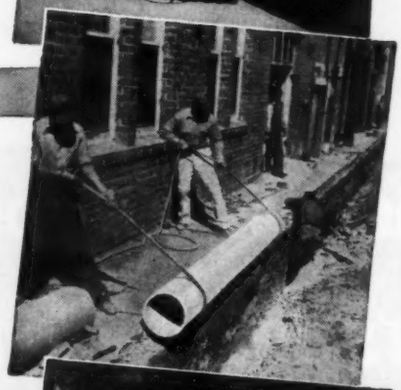
1. BIGGER TRUCK LOADS

Right from the start, easy-to-handle Transite Pipe begins to pay off. Its lightweight means more footage carried per truck load . . . lower hauling costs.



2. SMALLER CREWS

On the job, it takes fewer men to handle Transite Pipe, and smaller installation crews mean lower installation costs. Mechanical handling equipment is not necessary except for larger sizes.



3. FASTER ASSEMBLY

In the trench, Transite Pipe is assembled easily, even by unskilled crews. Simplex Coupling assures tight, flexible joints. And they *stay* tight, even when the line is deflected as much as 5° at each joint.

* * *

And in service, Transite Pipe pays off in efficient, dependable water transportation over the years. Made of asbestos and cement, this non-metallic pipe is immune to tuberculation, highly resistant to soil corrosion.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville

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TRANSITE PIPE

FOR EFFICIENT, ECONOMICAL WATER TRANSPORTATION

reasons, with least attention to purely mathematical considerations of resulting size.

Although the resulting sizes of the departments vary widely, even the smallest was found still to contain several clearly defined businesses, suitable in each case for assignment to a product division manager, who, in turn, is responsible to the department manager.

Likewise there is sometimes a similar subdivision of activities on an overall product basis to section supervisors within the product division, the objective being to attain responsible general management as close as possible to the daily problems and daily decisions of the individual transactions and the individual productive efforts.

As everyone will recognize, this is a pure line or military type of organization. It is the only type we knew about from the time of man's earliest banding together.

As a result of studies, and taking thorough note of the continuing experience of other firms, in like circumstances, we came to the conclusion that it was necessary to have both staff and line types of organization structure. This modification, as we see it, retains the best features of the line organization, which are simplicity, clear definition of responsibilities and authority, and in addition, preserves unharmed the advantages of the functional organization.

Functional Activities Unified

Immediately following the decentralization of operations, the corresponding integration was begun that had as its purpose the unifying on a company-wide basis of the functional activities and developments in each technical field. Typical staff functions of research, marketing, engineering, manufacturing, treasurer, controller, law, employee relations, and corporate affairs are being performed. To crystallize the experience of the present executives, there are single executives under the foregoing headings in some cases. In others there are two or three executives reporting directly to the president.

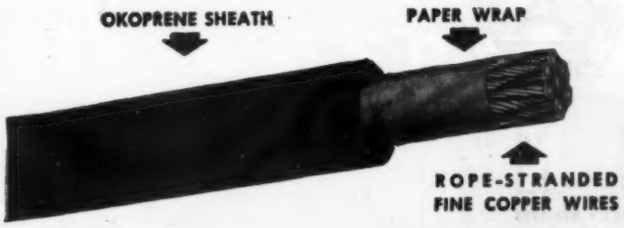
The assignment of responsibility for results and the delegation of corresponding authority were complete in the case of the seven top department general managers, with two exceptions. The first limitation is in those cases where the president desires of his own accord to intervene at the level of policy determination. The other is where the line executive differs with the staff recommendations on policy and the staff officer concerned believes

BUILT TO STAY ON THE JOB LONGER

...OKOCORD welding cables

For the many welding jobs in plant repair departments ... for steel fabrication and in construction work ... delivery of electrical power can be entrusted safely to Okocord Portable Cables.

Okocord cables for welding are designed to transmit uninterrupted power under severe conditions and external abuse. In the Okocord single conductor electrode-holder cable shown here, fine copper wires are rope-stranded for greater flexibility. They give longer life because they are first stranded together on the Uni-lay* principle and then "lubricated" by Okonite's special treatment. Their increased flexibilty results in better welding through easier, less tiring use of the electrode-holder. A paper wrap over the conductor leaves it clean for terminating, increasing flexibility still further. Additional mechanical strength is provided by seine twine cords embedded in an Okoprene sheath while the Okoprene protects against corrosion, resists oil, acids and alkalies.



There are many other types of Okocord portable cords and cable which cover a wide range of industrial applications. The Okonite Company, Passaic, N. J.

Method developed under wartime secrecy for the U. S. Navy

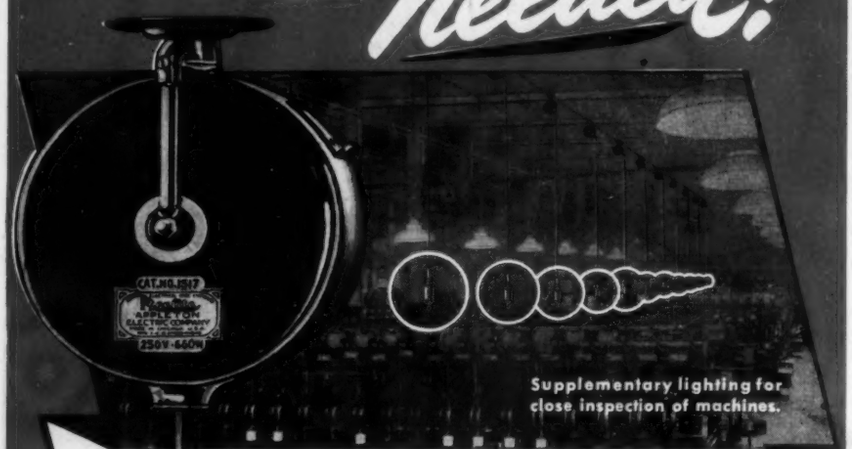
OKOCORD ELECTRODE-HOLDER CABLE

Size A.W.G.	Number of Wires	Carrying Capacity Amperes	Volts drop 60° C. Copper Temp.
4	1078	100	3.18 per 100 ft.
3	1372	150	3.70 " " "
2	1715	200	3.92 " " "
1	2156	250	3.88 " " "
1/0	2695	300	3.72 " " "
2/0	3381	375	3.68 " " "
3/0	4263	450	3.51 " " "
4/0	5341	550	3.41 " " "

OKONITE

insulated wires and cables

Light RIGHT where it's Needed!



Supplementary lighting for close inspection of machines.

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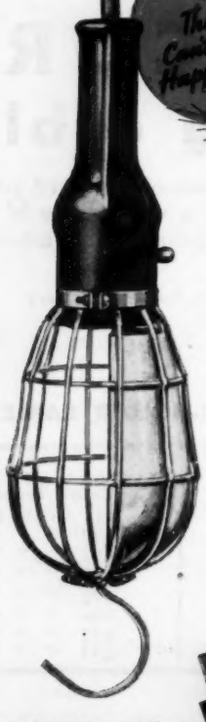
★ No tangles, kinks, or breaks in light cables!

★ Outlasts ordinary cord 6 to 1!

Any spot in your plant where portable light is a necessity—for machine inspection, car loading, stock-keeping, maintenance work and what not—Appleton Reelites furnish right light, instantly, safely, and with an almost unbelievable saving in wear and tear on lamp cord.

Reelites, which work on a rachet stop like a window shade, protect electrical cable—keep it reeled up out of the way, yet held at the desired length without tension. Accidents are eliminated, efficiency increased, cord costs cut to a minimum.

Practically every plant can use Reelites for lighting or for power tools. Reelites are available in machine tool and cloth-cutting types, and in heavy guard and vapor-proof types.



Levolier socket with or without switch in handle. Heavy wire guard takes 40 to 75 watt lamps.

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14 Branch Offices and 7 Resident Representatives in All Principal Markets

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APPLETON ELECTRIC A PRODUCTS

APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • RECEPTACLES

the matter of sufficient importance to ask the president to hear the evidence and establish the policy. Such a situation will be very infrequent, but historically its ever-present possibility is required to get proper cooperation with the staff by line executives who are usually busy, devoted at a given moment to the present more or less inflexible way of doing things, and traditionally distrustful of staff work which is usually adding the new to the old, if not substituting the former for the latter.

Now how does all this work together without confusion, or without requiring the president or his immediate staff to act as arbitrator in the sincere differences of opinion between the line and staff officers? For this purpose two committees, under the chairmanship of the president, are in operation. One, the president's advisory committee, is comprised of all officers of the company, both staff and line. This group discusses, reviews, and recommends broad company policies. The execution of these policies is the responsibility of the line officers. The development and recommendation of the policy comes from the staff officers and the execution or performance of the policy is naturally the responsibility of the line officers.

The other committee is the operating committees which is a small group whose responsibility, as the name indicates, is in the area of operations.

•

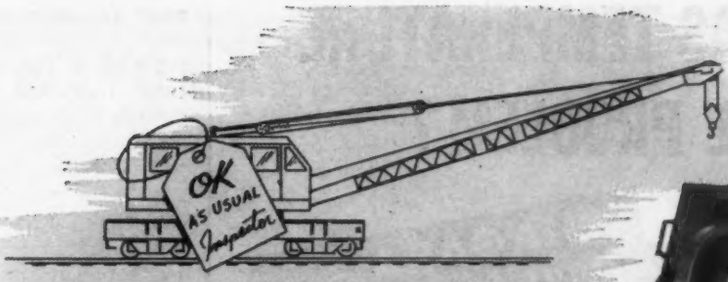
Are Foremen Part of Management?

THOMAS A. SULLIVAN, Plants Manager, Gas Mask Division, Johnson & Johnson, Chicago

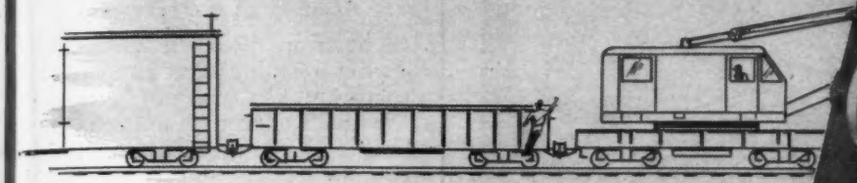
In attempting to determine whether foremen are part of management, the first question that comes to mind is "What are foremen?" For purposes of definition let us assume that any person who is in charge of a group of people and oversees and directs their work is a foreman. Foremen may be called by different names in different organizations. They can be called supervisors, general foremen, assistant foremen, and group leaders. To narrow down the problem still further, let us assume we are discussing a production organization, and the lines of authority flow as follows:

Top management
Department or shift superintendents
Foremen
Lead men and workers

Lead men may sometimes be called set-up men, reserve operators, or work-

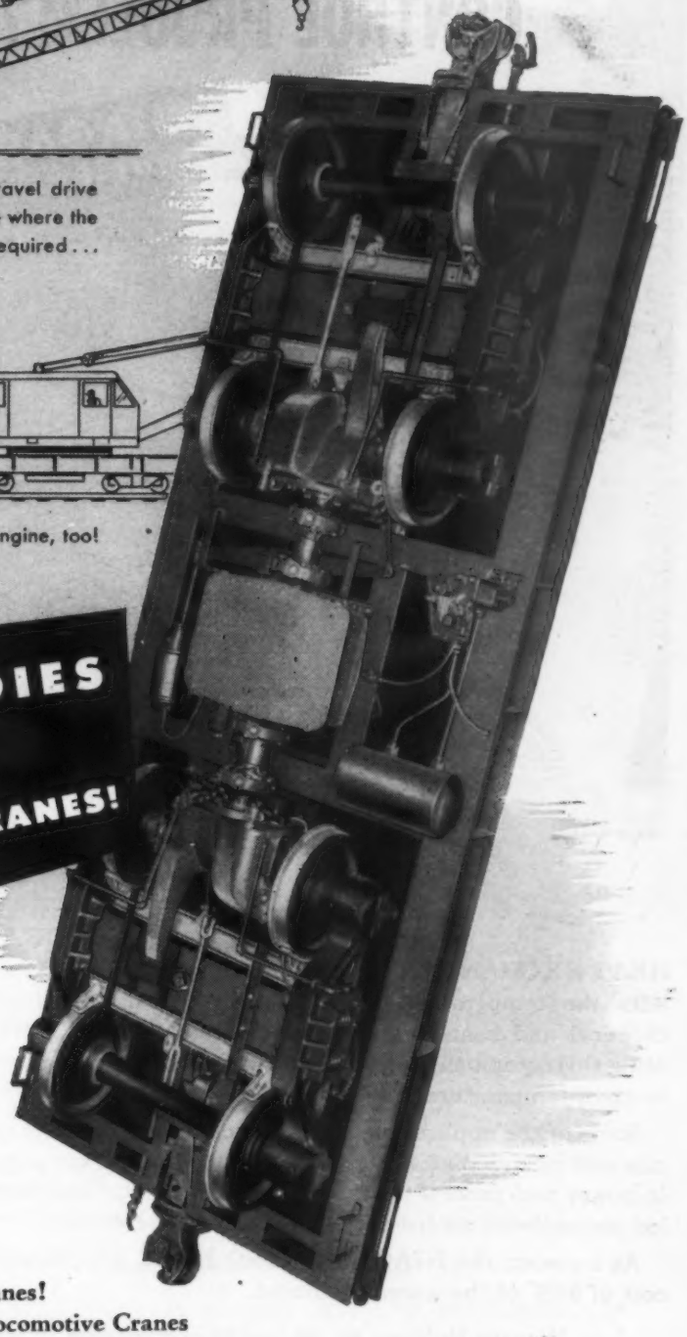


"American" construction of trucks and travel drive mechanisms greatly reduces maintenance where the bulk of locomotive crane maintenance is required . . .



. . . makes a better private switching engine, too!

COMPARE CAR BODIES *and you'll choose* "AMERICAN" LOCOMOTIVE CRANES!



"American" is the one manufacturer that specializes in whichever type of locomotive crane you want: Diesel, Diesel-electric, gasoline or steam. Each "American" type is INDIVIDUALLY DESIGNED FROM THE TRUCKS UP to fit its particular power plant — neither is an adaptation of another!

There's no "soft underside" to these powerful cranes! For reasons that are apparent here, "American" Locomotive Cranes travel easier, pull more cars, make sharper turns and stay out of repair shops for longer periods. Have an engineer discuss all "American" car body construction features with you in detail. And remember, "American" Diesel-electrics, which have an electric motor in each truck, are even more maneuverable and easily operated than the type illustrated.

AMERICAN
HOIST & DERRICK CO.
St. Paul 1, Minnesota
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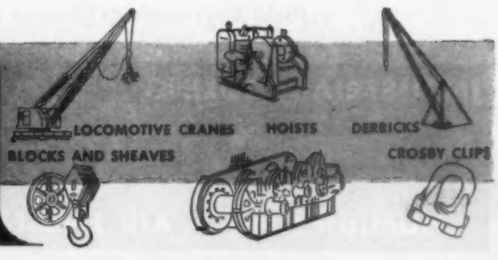
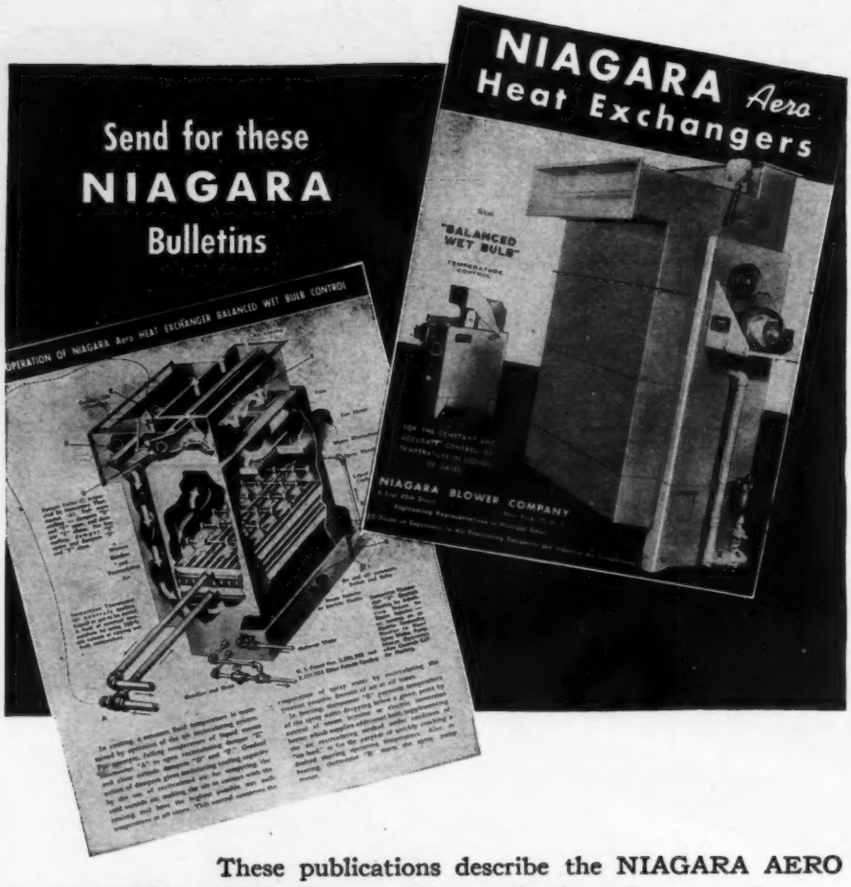


LIQUID OR GAS TEMPERATURE CONTROL PROBLEM?



These publications describe the NIAGARA AERO HEAT EXCHANGER and some of its applications. It accurately regulates the temperature of gases and liquids. Industrial plants using chemical and heat-treating processes have gained extra benefits from using this equipment wherever cooling water is used or any fluid is cooled to exact temperatures.

Some of the applications are: controlling temperature of liquid chemicals and intermediates in process; controlling jacket water temperature in power and process equipment; regulating the temperature of controlled atmosphere; controlling liquid bath temperatures.

As a cooler, the NIAGARA AERO HEAT EXCHANGER saves the cost of 95% of the water circulated.

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ing leaders. The major portion of their time is devoted to manual work, although they may be called upon to act as temporary foremen in the absence of the foreman. They often serve as a pool from which foremen can be drawn, and may participate in a training program to prepare them for foreman responsibilities, should they be selected at a later date. They are normally considered members of the working force and are part of the bargaining unit where one exists.

Duties of a Foreman

A foreman should be held responsible for everything that goes on in his department. On some things he should have full authority, and on other things authority to recommend and to refuse to accept, on other than a trial basis, anything contrary to his recommendations.

A foreman's duties divide into three classes and subdivide into many others:

1. Contacts with employees—

(a) Must be a leader, not a driver.
(b) Interpret company policies and explain procedures.
(c) Sell company to employees.
(d) Sell them the incentive system and the rates.
(e) Encourage suggestions.
(f) Handle grievances.
(g) Maintain discipline.
(h) Reduce absenteeism, tardiness, and turnover.
(i) Report any unusual employee performance.
(j) Merit rate employees.
(k) Make final decision on new employees before the end of the probation period.
(l) Induct and train all new employees.
(m) Recommend promotions, wage increases, transfers, demotions, and discharges.

2. Department duties—

(a) Plan work of department.
(b) Lay out production and maintain schedules.
(c) Assign work to all employees.
(d) Maintain quality standards.
(e) Promote good housekeeping.
(f) Control waste of materials.
(g) Make safety recommendations.
(h) Exercise proper care of equipment and tools.
(i) Report defective material or tooling.
(j) Examine operations for motion economies.
(k) Control department costs according to the budget.

(Continued on page 260)

PROVING Ground for

CLEVELANDS' Cost Cutting

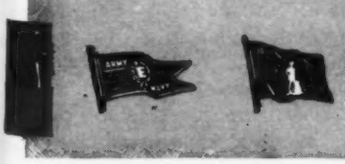
IN this fully equipped "automatic department" of the Cleveland Automatic Machine Company's plant, claims are proved before they are made.

Production estimates, which are important features of Cleveland Automatic proposals are all based upon careful figuring involving the cumulative experience of a staff of production experts. BUT . . .

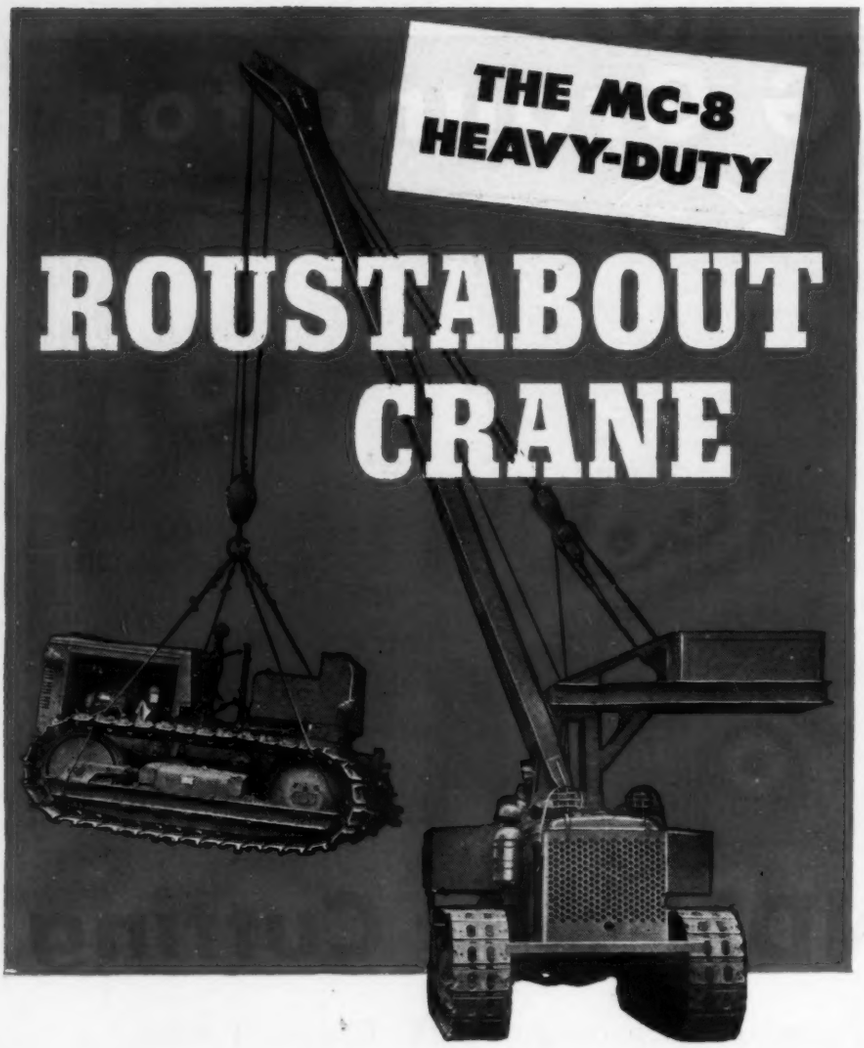
Unless the estimated time and cost savings are obviously certain to work out in practice they are PROVED on the proposed machine before being released to a prospective customer. YOUR JOB is set up, tried, torn down and set up again, until the BEST way to produce it at LOWEST COST is worked out. Actual production experience with our own machines is the foundation for our oft repeated theme . . .

Just Remember . . . Clevelands Cut Costs

CHICAGO (6):
1408c Civic Opera Building
DETROIT (2):
540c New Center Building
NEW YORK (6):
1806c Singer Bldg.
CINCINNATI (12):
4932c Beech Street
HARTFORD (1):
529c Capital National Bank Bldg.



THE CLEVELAND AUTOMATIC MACHINE CO.



Fast, versatile load-handler that hustles stuff up to 10 tons all around your plant

YOU have no load-handling emergencies when you have a Roustabout — whether it's a special car or truck loading job, a heavy machine to be moved, any usual or unusual handling situation, Roustabout is where you want it when you want it, quick, powerful, low cost — saving time and manpower. Easily, smoothly, it lifts 2 tons at 27½ ft. radius, 10 tons at 9½ ft. Boom turntable and all gears run in oil; built for years of overwork. Hundreds of industries regard their Roustabouts as indispensable. Write today for full story of these money-saving wheel or crawler cranes.

Roustabout saves you time and money on these and many other jobs

- Big stuff off and on trucks, freight cars
- Moving large machines and parts
- Handling bales, boxes, drums
- Moving big castings, motors, railroad and marine gear
- Loading air transport planes
- Handling tanks, pipe, structural steel, rails, timber
- Installing heavy valves and fittings

THE HUGHES-KEENAN COMPANY
623 Newman Street, Mansfield, Ohio

ROUSTABOUT CRANE
Roustabout Cranes
By Hughes-Keenan
Load-Handling Specialists Since 1904

THEY SAY AND DO *(continued)*

3. Contacts with superintendent or other departments—

(a) Help formulate plant policies.
(b) Keep immediate supervisor properly informed.
(c) Work harmoniously with staff personnel.
(d) Approve time studies.
(e) Notify engineers of methods changes.
(f) Participate in job evaluation.
(g) Know applicable labor laws and regulations.

Grievances

The foreman is handicapped in the exercise of the duties and responsibilities listed above by certain unsolved problems or grievances which render him incapable of doing a good job or make him dissatisfied with his lot. The basic problems and what higher management can do to solve them are:

1. Too infrequent contacts between foremen and executives.

Solution—Top management should make a deliberate effort to furnish contacts by (a) meetings attended by line and staff personnel; (b) recreational meetings and luncheons; and (c) regular trips through the plant by top management.

2. Foremen desire a voice in the development of plant policies.

Solution—All policies affecting their departments or employees should be discussed in meetings with the foremen before institution.

3. Confusion as to responsibilities and as to who is boss.

Solution—An organization chart showing responsibilities, and by (a) honest delegation of authority; (b) proper adherence to organization lines.

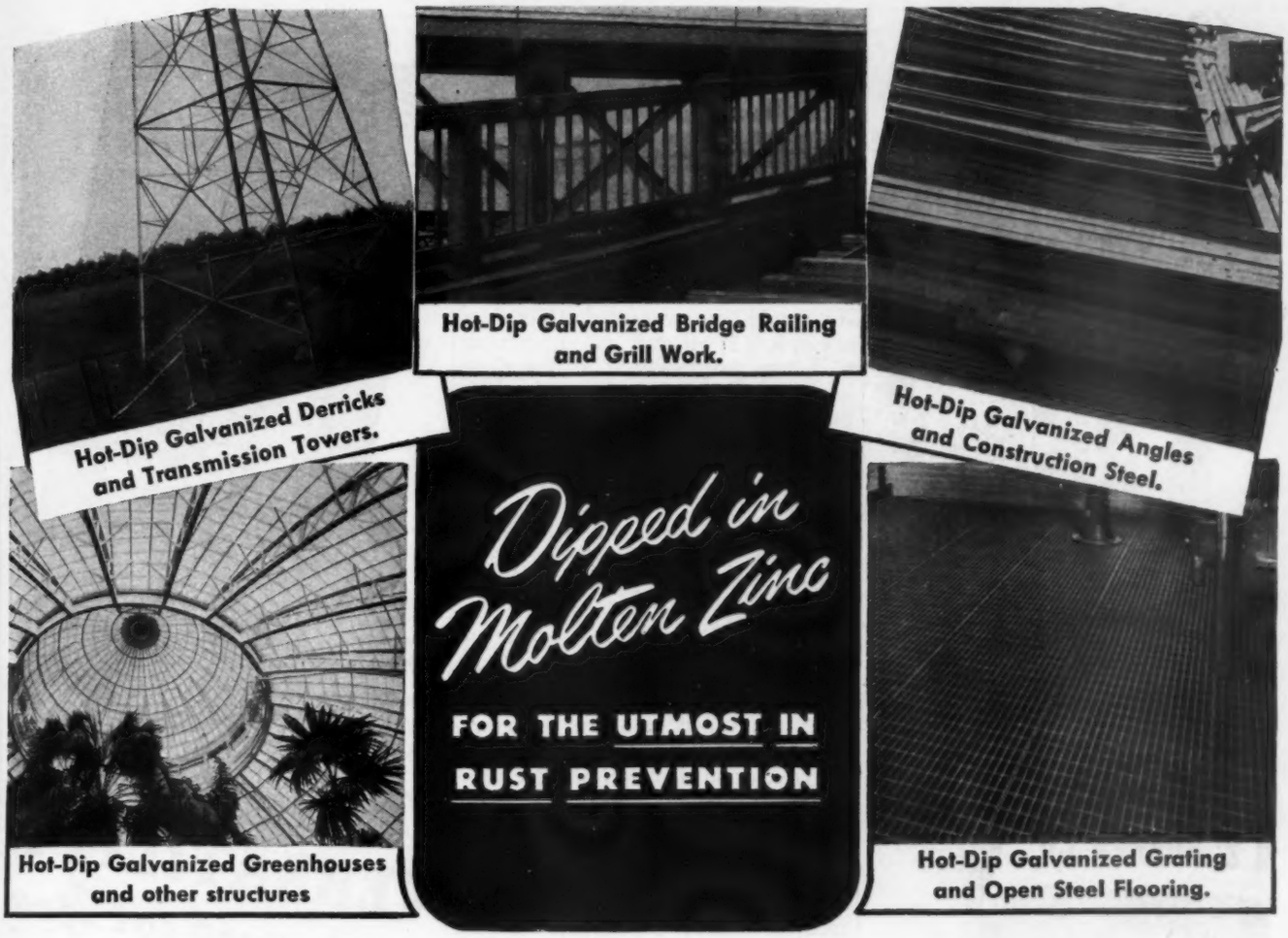
4. Too slim a differential between foreman's pay and the pay of those working under him.

Solution—Pay the foreman approximately 25 percent over the base pay of the highest evaluated job he supervises, and 25 percent over the average incentive earnings of his department.

5. Foremen want job protection.

Solution—There are several things necessary to give a foreman a measure of job security.

(a) If a demotion is necessary because of a cutback: (1) The downgraded foreman should return to his place in the plant seniority list; (2) foremen should be grouped in quartiles on the basis of merit rating and downgrading in each quartile, beginning


Hot-Dip Galvanized Derricks and Transmission Towers.
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Dipped in Molten Zinc
FOR THE UTMOST IN RUST PREVENTION
Hot-Dip Galvanized Greenhouses and other structures
Hot-Dip Galvanized Grating and Open Steel Flooring.

Hot-Dip Galvanized for Longer Life and Longer Uninterrupted Service

Time—unrelenting proving ground for quality—firmly establishes that there is no satisfactory substitute for molten zinc as a rust and corrosive preventive. Hundreds of thousands of actual case histories provide evidence that iron and steel, exposed to the ravages of rust, will last far beyond normal expectancy, render longer life and greater uninterrupted service, and save expensive replacement and maintenance costs when hot-dip galvanized by the American Hot Dip Galvanizers' Methods.

The members of this Association have established, and are pledged to follow consistently the highest standards in the Hot-Dip Galvanizing process.

The services and facilities of this Association are at your disposal. There is a member of this organization located near who will gladly discuss with you any galvanizing problems.

• • •

For any specific information write direct to: American Hot Dip Galvanizers Association, Inc., First National Bank Building, Pittsburgh (22), Pennsylvania.

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BUSY AMERICA EATS WHERE IT WORKS

with the lowest, be done on the basis of length of service as a foreman.

(b) If a foreman is not performing up to par: (1) This fact should be called to his attention; (2) he should be given an opportunity to improve; and (3) a record should be made of the interview.

(c) If after two or more warnings the foreman does not improve: (1) He should be downgraded rather than released; (2) if this is impractical, separation pay based on his length of service as a foreman should be given to him at the time of release.

6. Foremen want a procedure to assure them that grievances will be handled.

Solution—The immediate supervisor of the foreman should be trained to sense grievances and a rigid grievance procedure may be set up; the personnel department may act as intermediary; or grievances may be brought up at regular meetings.

An analysis of the duties of a foreman as set forth here can lead only to the conclusion that they are true management functions. Therefore the foreman performing these functions must be considered part of management. This can be implemented by a conscious effort on the part of top management to treat the foremen as part of management by:

1. Selecting men suited for the job.
2. Training them to perform the job properly.
3. Discussing all plant policies with them.
4. Telling them *first* about things affecting their departments.
5. Not giving orders, but explaining the problem.
6. Working with them, not over them.
7. Taking care of grievances.
8. Planning ahead to correct the problems outlined previously before they become grievances.

•

Job Plan Shows Skilled Workers Still Wanted

What a company can do for the people it has to lay off is illustrated in the successful job plan adopted by Northrop Aircraft, Inc., Hawthorne, Calif.

It took two years of planning, but the work involved has paid off in peacetime security for the 3500 men and women who were released by this company at the war's end. Today, in fact, Northrop has more requests for

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New and improved production techniques have opened up a vast range of adaptations. Some post-war uses include protective clothing, industrial fabrics, shoe materials, upholstery fabrics, luggage and handbags, raincoats, shower curtains, hospital sheeting etc. . . . Laboratory facilities for adapting Horco Fabrics to specific requirements are available to those interested.

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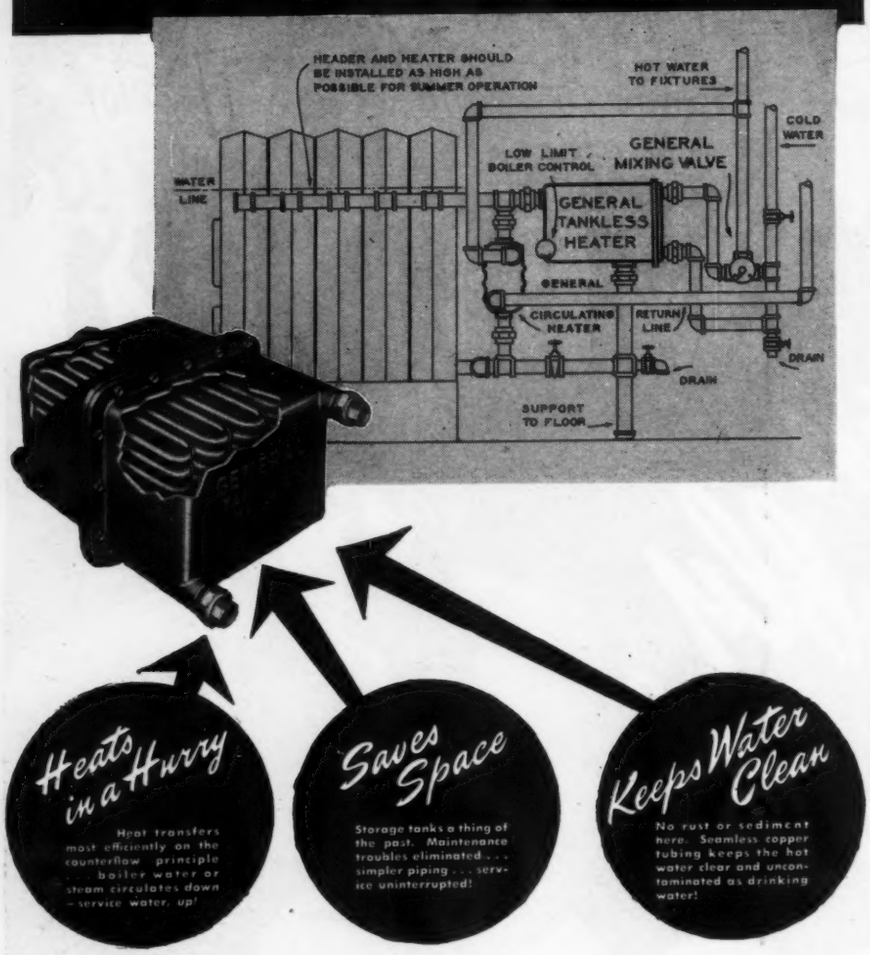
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skilled help than it has people to fill them.

For complete details of the plan, see the June issue of FACTORY. Briefly, it consisted principally of a double inventory. First was an inventory of all Northrop employees, listing their skills for both war and peace production, their earning capacity, and their preferences for post-war jobs. Second was an inventory of industry all over the United States, to learn its needs in postwar employment.

Thus the task involved was one of fitting round pegs into round holes. And instead of having too few jobs for too many people, as it had feared, Northrop finds that it has too many requests for too few people.

When a request for a man or woman for some particular job comes in, tabulating machines quickly show up every Northrop worker who has the skill required. Similarly, the tabulators can separate employees according to their pre-war homes—which means that those who want to return to their previous places of residence, have a good chance to get a peacetime job there.

•

Appraising Executive Performance

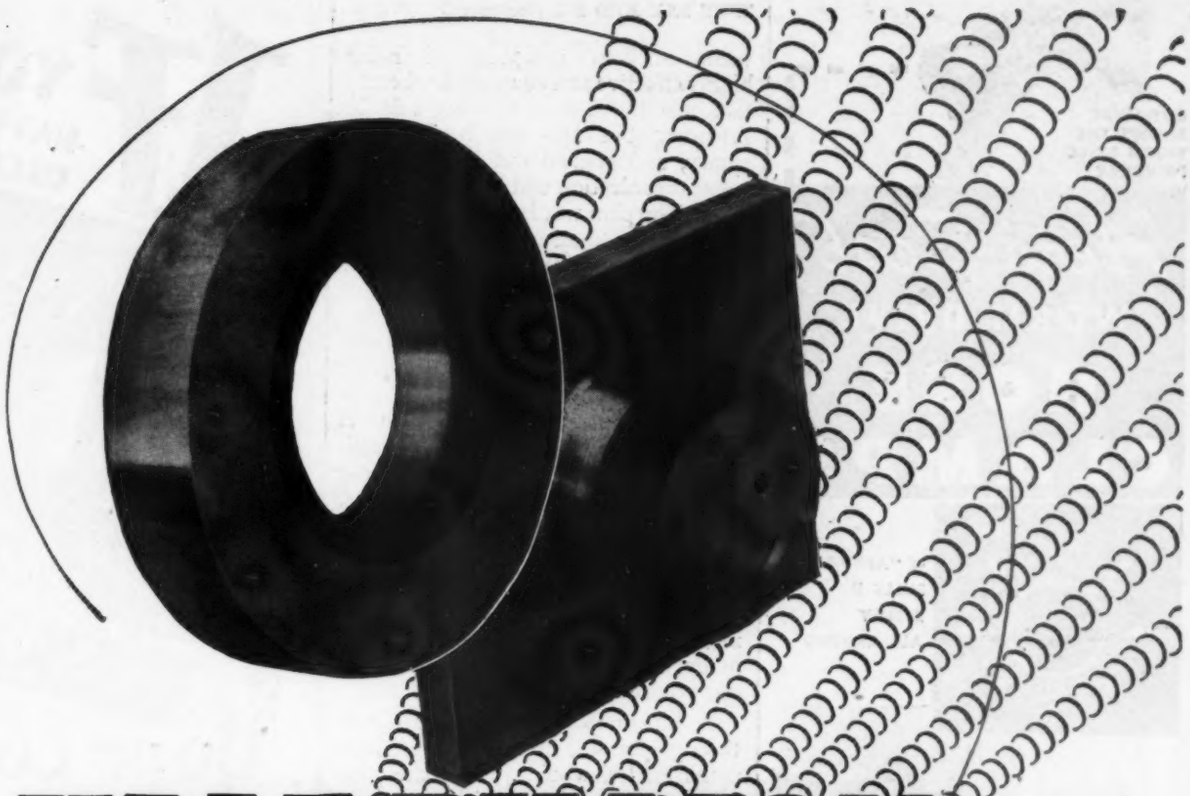
A. AUGUSTUS LOW, Vice-President, Consolidated Edison Company of New York, before the American Management Association General Management Conference

Filling vacancies in executive ranks constitutes a problem which makes a most eloquent appeal for some workable method of executive appraisal.

We of the Consolidated Edison Companies believe that we have what may be only one of many solutions to the problem in what we call our Executive Development Program. . .

In looking at this problem management discovered the existence of what might be termed a "lost generation" among the younger executives who must step in to fill gaps in management. . . Many of the younger, or perhaps shorter service, executives have come up through relatively narrow and highly specialized channels of the system's organization. . . (and) have not had an opportunity to expand their background of experience outside their own specialized operations. . .

Management inspected its young executive group from all angles, individually and collectively, all the way down the line. Considerable thought was given to ways and means of establishing an "executive training" program. As a result a plan was proposed, somewhat audacious, very simple, but



over a HALF BILLION "cookies" .... and STILL GOING with these Diecarb dies

The original die, at the latest count, had produced the unprecedented total of over a half billion stampings, and was still going!

SEVERAL years ago, in a Pittsburgh electrical manufacturing plant, a disc or "cookie" die was placed in operation. It was made of Diecarb, Firth-Sterling's newest, original, sintered carbide development for blanking dies. This "cookie" die blanked a circle of silicon electrical sheet .025 inch thick, to be used in rotors and stators.

It proved so successful that since then two other similar Diecarb dies have been put to work—all averaging *50 to 60 million* blanks per grind, as compared with 90,000 pieces per grind with high speed steel dies.

In fact, the life of these remarkable Diecarb dies is not yet determined because all dies so far made are still in use.

Diecarb can be used for blanking and forming a diversity of materials including metals, plastics, paper, etc. It operates successfully on thicknesses up to 7/16 inch. It is proving unmatchable for high production operations, saving both downtime and maintenance.

If you have a product that requires blanking or if you are planning one—call in Firth-Sterling now to test the possibilities of Diecarb.

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A complete Diecarb engineering service is at your call—for designing complete dies; for aiding in application of Diecarb to die shoes by brazing; shrink-fitting; press fitting and mechanical matrix; and for proper grinding.

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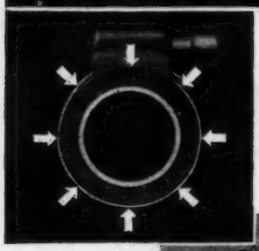
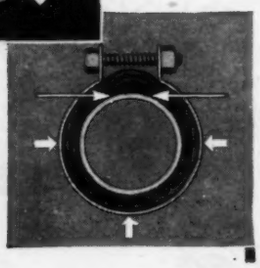


◀ "AERO-SEAL" PULLS U EVENLY ALL AROUND



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with excellent prospects of being highly effective and successful, whereby not only the desired training will be provided, but also the health, efficiency, and general well-being of the entire organization will benefit in many ways. The plan was facetiously dubbed the "Merry-Go-Round" and consisted simply of a systematic program of moving and interchanging executive or high-ranking supervisory employees from one job to another, where practical, throughout the organization, for suitable periods of time.

The "Merry-Go-Round" plan is commended by many advantages, both to employer and employee, and has only minor, temporary disadvantages. Some of the more important advantages are enumerated briefly as follows:

1. Provides a well-founded training and background of experience for the individual, familiarizing him with many other phases of the company's operations . . .

2. Streamlines the organization through periodic introduction of a new managerial viewpoint. Eliminates situations or operations which may have been carried down unnecessarily over a period of years . . .

3. Stimulates the development of the individual because of the element of competition introduced.

4. Eliminates the assumption by an individual of any "vested right" in a particular job . . .

5. Tests the individual. The executive ability and versatility demonstrated in the progressive assignments provide an indication as to which men are most suitable as material from which top flight executives can be drawn . . .

6. Will improve, and should in most cases eliminate, any situation where the efficiency of the organization is being impaired by lack of cooperation between individuals . . .

7. Widens the trainee's circle of acquaintance among executives . . .

(The plan) operates on two executive levels, the department head level and the bureau head level. The latter includes a few promising individuals somewhat below bureau head rank.

Assignments in the "top flight" are supervised and arranged by the executive vice-president and his committee of vice-presidents. Those in the lower level are arranged and supervised by a committee of more than 20 department heads, subject to the approval of the executive vice-president.

Any committeeman may propose likely candidates for inclusion on the roster of trainees, and, if such inclusion is approved by the committee, he becomes that trainee's sponsor, follow-

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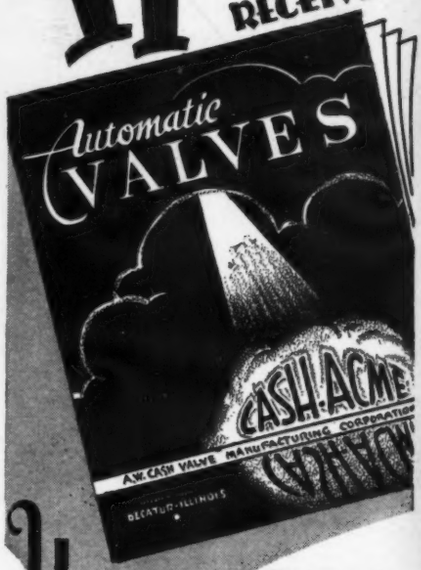

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ing up his progress in his various assignments.

In each level, the trainee's progress and accomplishment are reported to, and discussed by, the assembled committees as new assignments are being planned. He is thereby made known to all of the top executives, his qualifications are openly discussed, and his performance in each assignment is reported by the executive to whom he is assigned. There is no set or specific rating plan but his appraisal is accomplished, his particular aptitudes and abilities are determined informally, in the verbal discussion of him by members of the committee. . .

What are the results? First there has been an unmistakable improvement in the amount of cooperation between departments. A considerable number of supervisors, through the Executive Development Program, have acquired a real understanding of problems of departments other than their own. With this understanding they are much more inclined to try to work out a solution to a situation which actually is based on a desire to find out what is best for the company as a whole . . .

The second result that we can see today involves the extent to which the performance of supervisors and department heads could be said to be appraised.

From the reports we have received from department heads, vice-presidents, from conversations with many of the individuals who have been on the Executive Development Program, as well as from the marked improvement that has already resulted in interdepartmental relations, we are more than satisfied that the objectives are being accomplished.

•

How Canada Plans to Use War Factories

JAMES MONTAGNES, *Canadian Correspondent, Factory*

The Canadian government plans to retain ownership of a number of the larger war factories it has built in various parts of Canada, but plans to utilize the properties by renting space in the buildings to new business firms. The Department of Reconstruction, successor to the Department of Munitions and Supply, has turned these buildings over to the government surplus disposal agency, the War Assets Corporation, which, in turn, has placed realtors in charge of renting the space. The buildings will be rented for mul-

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Both types of PRO-TEK are applied before starting work. They are safe, sanitary and easy to use. Both are extensively used in many large factories, and are recommended by safety engineers and plant hygienists.

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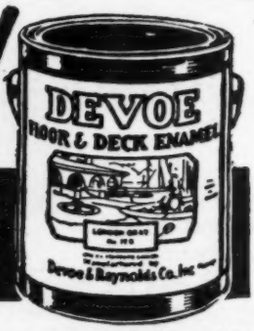

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Now that the war is over, Devoe Floor & Deck Enamel is again available with an alkyd-base—is again made from selected oils and sound synthetic resins that impart maximum durability. Devoe Floor & Deck Enamel is a general purpose enamel of pre-war quality *plus*, deriving new and important advances from Devoe's constant, war-inspired laboratory research and study. You'll find Devoe Floor & Deck Enamel ideal for use on interior and exterior floor surfaces of concrete, wood, canvas and linoleum; on machinery, interior metal surfaces, as a dado enamel in wall-painting work; in a wide variety of applications.

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tiple tenancy to assist post-war employment and to speed the reconstruction program.

Special committees have been set up to decide the industries to be accepted as tenants. The number of stable new jobs provided will be a major factor in determining the industries to be accepted. No warehousing tenants will be accepted, and only new industries or those with expansion programs will be given consideration. Factory space is currently at a premium in most Canadian cities, as Canadian manufacturers prepare for post-war trade.

•

Industries Will Increase Their Publications

An increase of 25 percent in new publications is being planned by 460 industries throughout the nation, according to a survey recently conducted by the Reconversion Survey Committee of the National Council of Industrial Editors.

Of this increase, 57 percent will be external publications, for salesmen and customers, 28 percent internal or employee publications, and 15 percent a combination of the two types.

•

The One Unused Tool of Management

JOHN M. HANCOCK, Partner, Lehman Brothers, New York, at American Management Association General Management Conference

About 35 years ago I underscored a sentence in my copy of a Gantt book. That sentence was "A system of management is a means of causing men to cooperate with each other for a common end." There is a wealth of philosophy in those few words, and let me pick out a few points for further emphasis. You note he called it a "means for causing men to cooperate." He didn't say a "means for compelling men to produce." He thought of the America he knew when we didn't dream of a regimented economy or a socialized state. He knew then what this war has proved to us—that no plan of coercion by the state will result in as much production as when free men work together for a common end. . .

Now there isn't anything new in all this, but it's the kind of thing we easily forgot in the troublesome years of the last decade. During that decade the men of management have been prisoners of war in an occupied territory. . .

I don't believe America will go knowingly to state socialism. It might

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WITH THE SAME SEGMENT SPECIFICATIONS MONTH AFTER MONTH

"Fractional Grading"... the exclusive Bay State feature that makes it *easier* for you to select the Bay State Segment Specifications that will remove the right amount of metal in the least time at the lowest abrasive cost . . . also assures you that those specifications will be *more closely duplicated* on repeat orders.

That's because only Bay State Segments are made in *three degrees of hardness within each usual grade.*

Such precise control of hardness is achieved by manufacturing processes that also control porosity and give bonds extra holding power.

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On surface grinding jobs that can use segments with extra wide open pores, you'll find Bay State's KOOLPORE processed segments give you faster, cooler cutting... more efficient production.

For more facts about the ability of Bay State Segments to give *top performance consistently duplicated,* write for literature... today.

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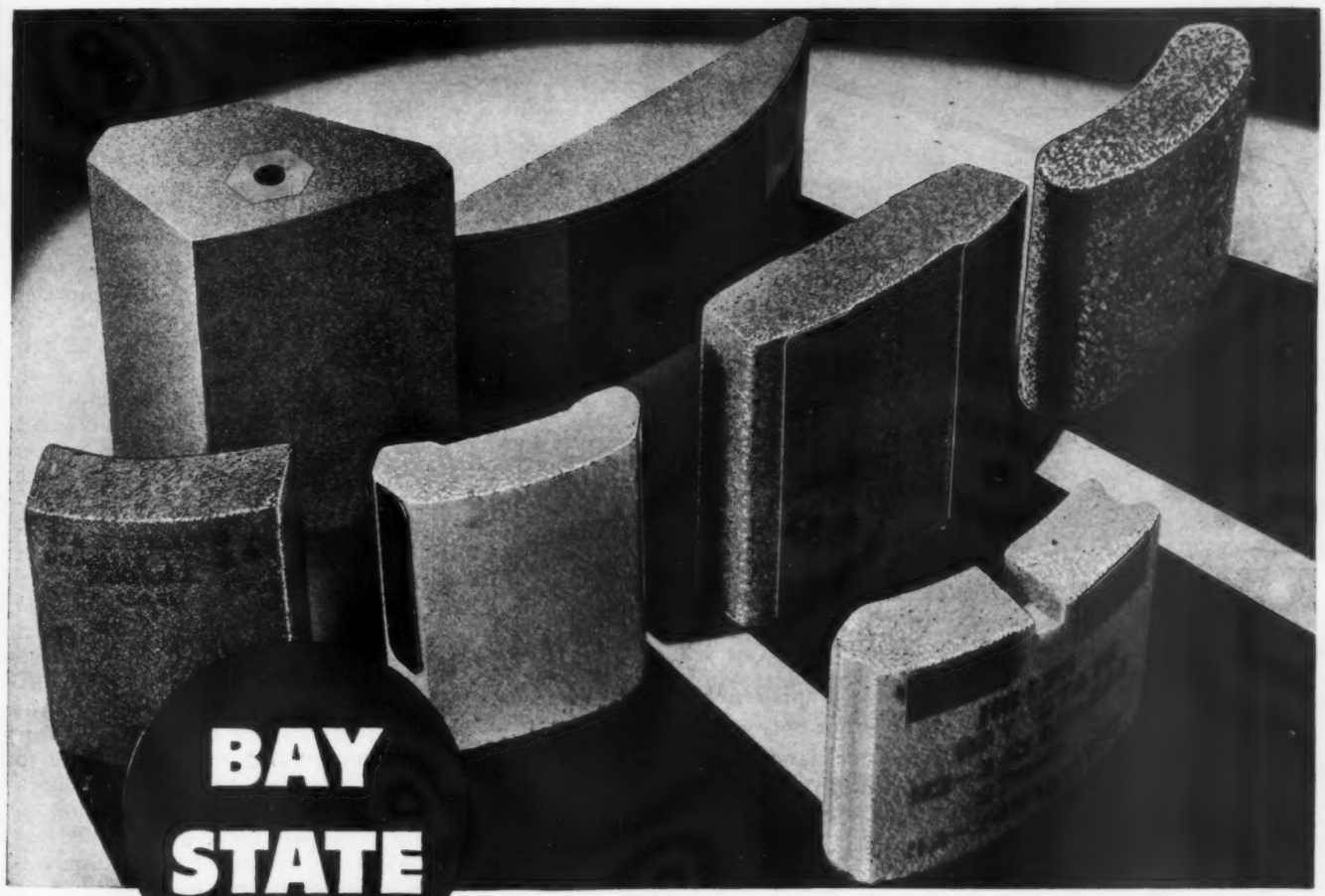

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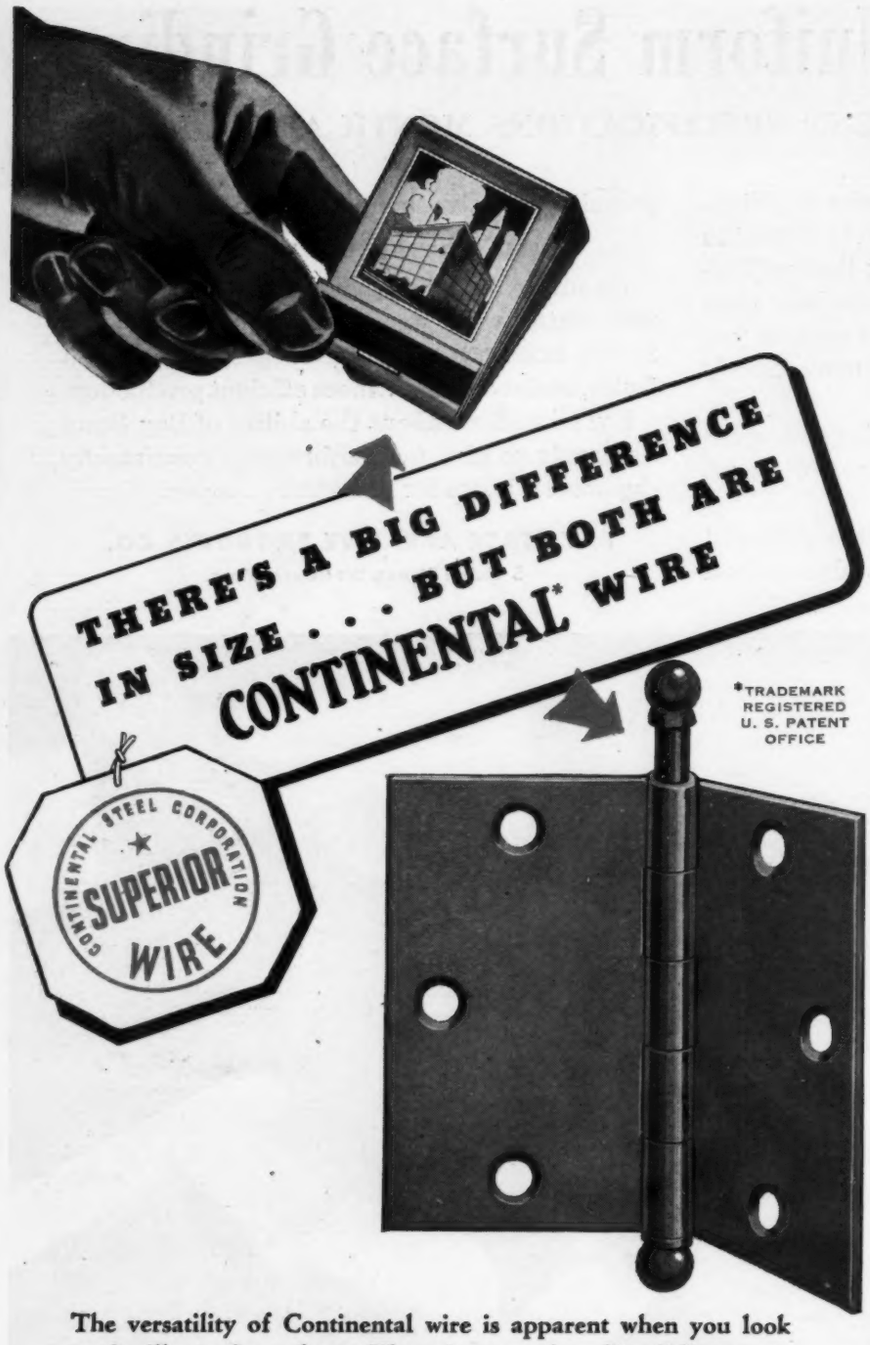

The versatility of Continental wire is apparent when you look at the illustrations above. There is not only a big difference in the size of the wire in the match book and the pin in the door hinge, but there is a big difference in the temper, analysis, and finish. Continental wire for each of these applications is made especially to meet the individual requirements.

Continental specializes in producing wire in a vast variety of shapes, tempers, analyses, and coatings to fit the particular specifications of hundreds of products. You are invited to take advantage of this service. Write or wire today for complete information.

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conceivably slip into it unwittingly, or go into it a step at a time, but the pressure to do so will not arise from the people generally on their own initiative. It will come from those who will make promises of its benefits for the sake of winning votes. . .

Let us look at this problem of wide employment. It is my belief that the way to get more employment is to proceed to get more employers by inducing them to expand their activities, or to start new businesses, either as self-employers or as the employers of others. . . I think the responsibility of government is primarily to clear the way for people to provide jobs for themselves and for employers to employ others, and in general to clear the way for people to do their own planning with reasonable assurances as to important government policies. . . .

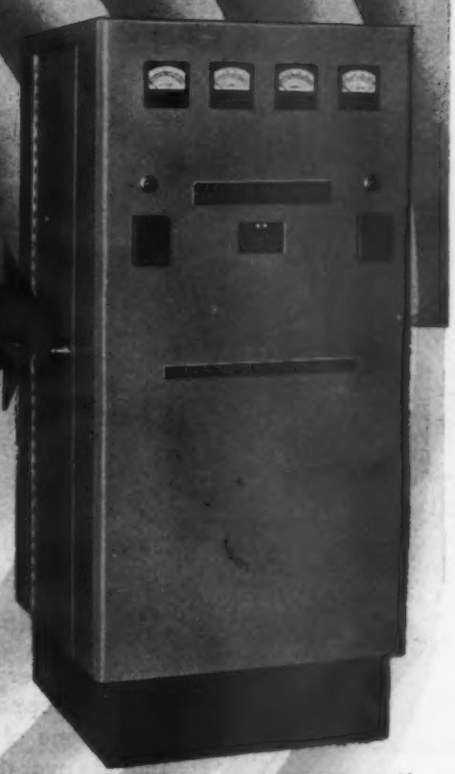
With that background I want now to paint in what I think is the responsibility of corporate management. There can be no formula for handling the problems confronting you in these days. The best that I can do is to place some channel markers and warning beacons along the course of a successful business, one that is successful first because it provides better goods to consumers at progressively lower prices, and second because it provides fair reward to all in the group who share in the production—workers, management, and stockholders. *Management has this responsibility, and cannot share it, for responsibility is not divisible.* . . You were chosen for the responsibility for only one reason—that you possess the greatest power of management—simply the ability to influence people to cooperate for a common purpose. . . .

Now for that great talent, let me point out the greatest opportunity and the greatest responsibility—the maintenance of our faith in our form and kind of government—the keeping of the sword of free enterprise as bright and untarnished as when it came to our time. That job is a challenge to every man who is willing to stand on his own feet, every man who knows that a drift toward state socialism will be a leveling down process and not a leveling up, a process that will destroy both the freedom and the enterprise of all the people. . . .

If this great ability to influence people is used on this one problem as it is used so well on so many less important problems, then the American way of life will survive—equal opportunity to all, personal responsibility for one's well-being, no leaning on a beneficient government with no coercion by anyone and no favors by government to any individual or group.

heat

induction or dielectric



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FAST with MEGATHERM*

Ready . . . at the push of a button . . . MEGATHERM'S megacycle energy puts heat *where* you want it . . . instantly!

Induction . . . for thin-skin and contour hardening, annealing, brazing and soldering. Ferrous and non-ferrous metals quickly processed!

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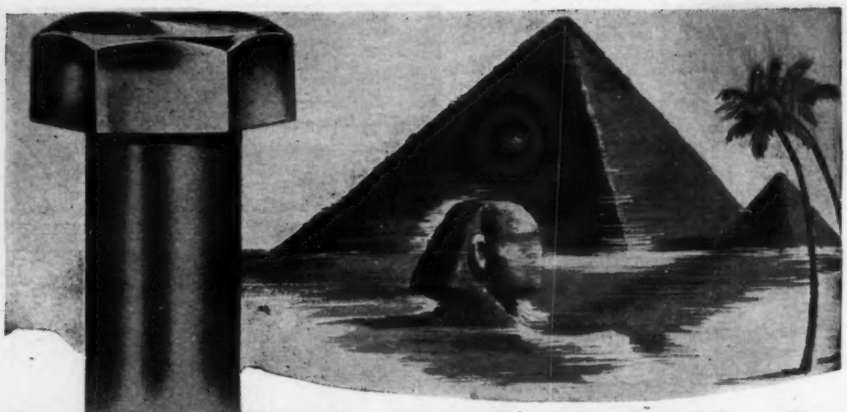

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For countless ages, the Pyramids of Egypt have withstood the disintegrating forces of time and the elements. In comparison with the span of human life, the Pyramids are everlasting. In applications without number, Harper bolts, nuts and other fastenings resist rust, corrosion and other destructive conditions. Compared with assemblies they hold together . . or with common steel bolts . . . Harper Fastenings are everlasting.

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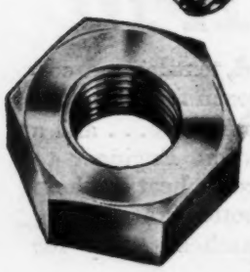
Every Harper fastening is made of brass, bronze, copper, Monel metal, or stainless steel (none of common steel). Harper stocks include over 4360 items of bolts, nuts, screws, washers, rivets, nails, and special fastenings. New stock items are being continually added. Special fastenings made to order quickly from large stocks of metal in bars, rod, wire, sheet and other basic forms. Write for 104 page, 4 color catalog.



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Avoiding Suggestion System Pitfalls

DAMON CARTER, Suggestion Secretary, Holtzer-Cabot Division of the First Industrial Corporation, Boston

Satisfactory operation of the suggestion system at the Holtzer-Cabot Division of the First Industrial Corporation, in the opinion of the company's management, is a result of adherence to a number of well-tested principles and policies.

Holtzer-Cabot has found that, if the rejections are well handled, a suggestion system is pretty sure to function well. This is quite logical when it is considered that approximately 75 percent of all suggestions are due to be turned down. Normally the accepted 25 percent takes care of itself.

Handling rejections well means using every possible means to see that the suggester gets a fair answer, and then giving him every opportunity to discuss the cause of rejection. To give a fair answer requires:

1. Investigating the suggestion thoroughly and being sure of the grounds for rejection.

2. Writing as clear a letter as possible to the suggester explaining the facts.

3. Delivering the letter personally and giving him a chance to talk it over.

This procedure may precipitate some arguments. It may also show that the suggestion was misinterpreted and should be reopened before the suggestion committee. Holtzer-Cabot has found, however, that the majority of employees are sensible men; when they have been shown good reasons for rejection of a suggestion, they accept the decision gracefully. Showing them why is a responsibility the operators of a suggestion system must accept if they want it to work.

The show-why rule is part of an unwritten policy at this company, where the suggestion system has been flourishing for a year and a half. Although differences of opinion appear, the men realize their ideas are getting a square deal. Their response with better suggestions is constant.

Of course there are other rocks a suggestion system can run into, and Holtzer-Cabot has hit its share. Like the old mariner, who can always find the rocks because he has hit them himself, we should like to point out a few to companies who see breakers ahead.

This company's experience indicates that no cure-all scheme can be de-

GARLOCK LATTICE-BRAID PACKING Lasts Longer!

BECAUSE ALL STRANDS ARE STRONGLY LATTICE-LINKED TOGETHER!

PATENTED

The unique structural design of Garlock LATTICE-BRAID holds the strands together even when the packing is worn far beyond the serviceable limits of wear of ordinary braided packings.

This same "lattice" braiding provides unusual flexibility and semi-automatic pressure action.

Garlock LATTICE-BRAID packing is furnished in several styles for various types of service. Write for illustrated descriptive folder.

Garlock 731 Lattice-Braid Coil

GARLOCK

THE GARLOCK PACKING COMPANY, PALMYRA, N. Y.

In Canada: The Garlock Packing Company of Canada Limited, Montreal, Que.

BEWARE OF

"DOUBTFUL ORIGIN!"

There are mongrels in lighting products, too! You know the kind—a bit of light-gauge metal, haphazardly bent to shape . . . probably bootleg wiring parts . . . a slip-shod paint job.

Now that our war contracts are a closed book . . . now that you can once again obtain SILV-A-KING fixtures . . . why even consider these mongrels of the lighting industry? The metal that goes into SILV-A-KING products is the best heavy-gauge steel available. The lifetime porcelain-enamel finish on SILV-A-KING fixtures is there for keeps. The engineering and manufacturing "know-how" behind SILV-A-KING fixtures is something you just can't expect from the "tin-knocking" crowd . . . something you take for granted in products that bear the SILV-A-KING label.

SILV-A-KING "SPECIFICATION"

Lifetime porcelain fluorescent unit

SILV-A-KING LIGHTING EQUIPMENT

BULLETIN 45 FS—YOURS FOR THE ASKING!

BRIGHT LIGHT REFLECTOR CO. INC.

Fairfield and State • Bridgeport 5, Conn.

veloped; that each system must be tailor-made for the company which uses it. The normal course is a year of revision in operation before the system "takes," and by that time its lines will begin to conform to the policy lines of the company as a whole.

Holtzer-Cabot expects a great deal from the suggestions system. It wants new ideas and wants to capitalize on them. It wants a lot of intangibles that come under the heading of morale. It wants to demonstrate in one more way to employees that management has faith in them and can be trusted to give them a square deal.

This company has learned it is important for management constantly to show its own belief in the system. Although this sounds obvious, it is far easier said than done. Yet it is certainly unreasonable to expect employees to believe in a system that management does not believe in.

Publicity a Prime Need

Experience here has shown pretty clearly that any publicity which keeps the suggestion system in the public eye is good. This includes a suggestion booklet outlining a definite and fair policy, bulletin boards for all kinds of posters and announcements, and the presentation of large awards in the plant cafeteria. These methods are used constantly at this company, and with varied emphasis.

A page a month in the house organ is devoted to the suggestion system, and one of the most satisfactory methods of using this space has been a picture of the suggester at his machine with an enlarged insert illustrating his suggestion.

Good results have come from asking for suggestions on particularly difficult operations throughout the plant, giving a new assignment each month. Suggestions received in response to a recent plea for simplification of some machining operations on one of the newly developed products cut the costs of machining by one third.

Cash Awards Only

When the suggestion system was started, it was planned to give pins and scrolls in conjunction with cash awards, but a survey of employee reaction on this subject showed that the pins and scrolls would have very little value.

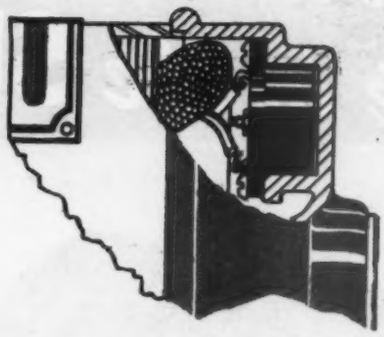
At one point in operating the suggestion system a course in methods training was given to approximately 25 employees. The idea was that they would help spread the ideas of better methods throughout the plant, and that more and better suggestions would

Reduced Expense Accounts for Motors with Built-in KLIXON MOTOR PROTECTORS

Electric motors equipped with built-in Klixon Protectors . . . are trouble-free motors. Why, because Klixon Protectors prevent motors from becoming overheated and burning out. Low in cost, they quickly pay for themselves by practically eliminating motor repairs and replacements and minimizing production delays.

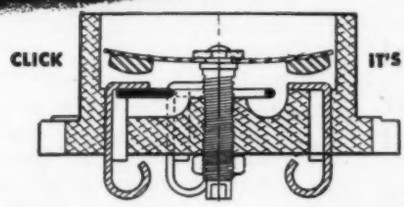
Because they are built into the motor by the motor manufacturer, Klixon Protectors are matched exactly to the motor assuring a proven and tested combination of motor with adequate protection. Yet, Klixon Protectors never unnecessarily interfere with the normal operation of motors . . . . always permit maximum operating capacity.

Always insist on built-in Klixon Protectors with every motor you buy. They are available for A.C. motors all sizes; D.C. motors up to 30 volts. Write for Bulletin PR-112.

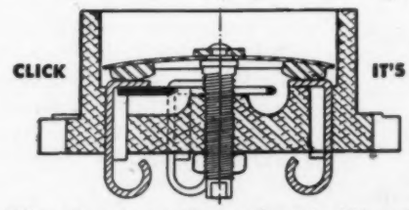


AUTOMATIC RESET

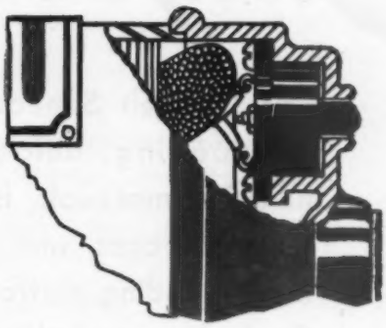
Automatic reset types are recommended for all applications except those where unexpected starting may cause injury. Examples of automatic reset applications are refrigeration, air conditioning, air compressors, blowers, and any unattended or automatically controlled equipment.



Should a motor become overheated and dangerously hot, the Klixon Protector snaps the power "off" preventing the motor from burning out.



When the motor cools to safety, the Klixon Protector snaps the power "on" automatically if the automatic reset is specified . . . *or when the reset button is pushed when manual type is specified.*



MANUAL RESET

The manual reset type should be used for those applications where hazard is involved in an unexpected starting of the motor, such as washing machines, hand tools, power saws, machine tools, irons, etc.

SPENCER THERMOSTAT COMPANY — KLIXON — **ATTLEBORO, MASSACHUSETTS**

In the YARD-- *or in the* SHOP--

IT'S ALL THE SAME TO THE *Cargocrane!*

This Link-Belt Speeder goes everywhere! For loading, unloading, stacking or handling materials, it gets in and out of narrow spaces, and maneuvers easily on docks, loading platforms, storage depots. Or, in shops and plants, use it like a mobile jack, to lift as well as carry; to aid in assembly, construction or repair work.

Full hydraulic control makes operation quick and easy. "The most useful machine in the shop." Get folder 2033 for full details.

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Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

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result. It was found, however, that a little knowledge along this line is a dangerous thing and that, while some suggestions were decidedly better, others were way off the beam, and rejections were much harder to explain. This practice was discontinued.

In the experience of Holtzer-Cabot, money is the prime incentive in a suggestion system. Prestige is a runner-up only. Therefore, in the promotion of the suggestion system the monetary theme is emphasized.

Clear Policy Necessary

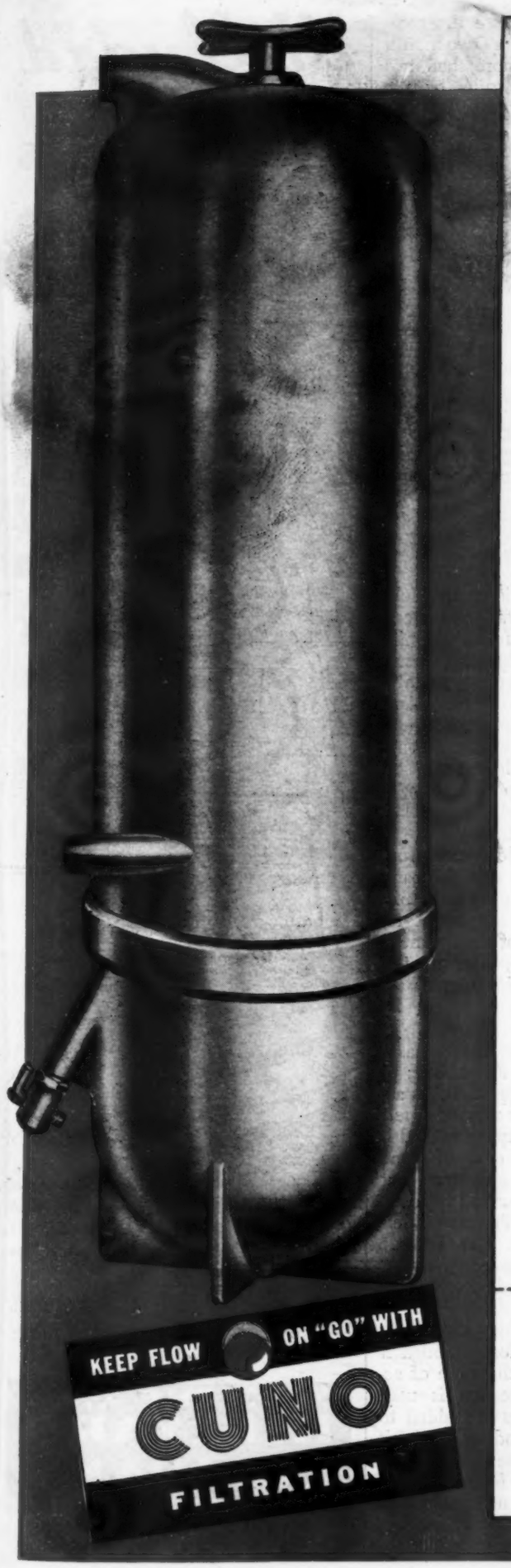
Biggest problem in selling the suggestion system in peacetime is expected to be fear that suggestions may put other men out of jobs. It is indicated by experience in this company that an employee values his standing in his own group more than his position in the eyes of management, and to put another man out of a job through a suggestion, however valuable to the company, would be unforgivable. A solution to the problem, possibly the only one, is to *establish the policy that no suggestion ever puts a man out of a job.* It can be plainly stated that no suggestion that eliminates a job will be installed until another job is found for the displaced man.

This policy goes a long way toward building confidence in the suggestion system and in the company. Experience indicates, however, that it will continue to be difficult to convince employees that there is constructive value in an idea, a machine, or a method which throws 10 men out of work in one plant, even though it may cause 200 men to be hired throughout the nation in jobs directly related. Only definite and publicized company policy can combat the resistance to technological progress.

Size of Award Important

Since money is the prime incentive in a suggestion system, Holtzer-Cabot believes that a good award policy is the most important single factor for the system's success. Although the award may range from 10 to 25 percent of a year's savings, or some modification of this schedule, it is in carrying out the policy that care must be used. For example, it has been found that when an award is in doubt, it is better to pay than not to pay, regardless of the amount involved, from the minimum of $5 up to a questionable $1000 maximum.

It is company policy to pay the full gross savings for two months of operation. Since most operations do not run for a year, this policy has proved successful with operators and



Fine Finishes

...less filter cleaning with this lower-cost filter

Cuno's new COOLANT-KLEAN was developed especially for grinder coolants to help produce scratch-free surfaces . . . greatly extend wheel life and make element replacement quick and easy.

Here's new assurance of better finishes — and savings in filter cost, maintenance and replacement, plus a bonus in longer coolant life.

Firms using Cuno's new COOLANT-KLEAN have expressed amazement at the greater amount of dirt collected . . . the infrequency of bag replacement . . . and the elimination of "pick-ups" on the work.

You can now obtain — with COOLANT-KLEAN — extremely fine finishes, even at the end of an up-to-6-weeks period without changing the bag. Coolant stays cleaner — needs changing less often. Less loading of the wheel, too.

LOWEST-COST FILTER

COOLANT-KLEAN meets specifications at lowest cost. It is priced less, to begin with, than most filters. Maintenance is less — fewer new bags, less time for replacement (under 5 minutes), lower cost of new element — than for any other comparable replacement-element filter.

NEW CONSTRUCTION PRINCIPLE

COOLANT-KLEAN handles full flow of coolant or cutting oil, yet requires less floor space than other, more expensive types. No filter aid needed. Eliminates precoating time. Gets away from "stuffed type" elements. Is applicable to individual machine or central system.

DESCRIBES "FINER FINISHES AT LESS COST"

This newest advance in coolant-cleaning is described in Bulletin 3110. Send coupon now for your copy. Find out how simple it now is to obtain finer finishes at less cost.

SEND COUPON FOR INFORMATION ON FILTERING COOLANT

CUNO ENGINEERING CORPORATION
610 South Vine Street, Meriden, Connecticut

Gentlemen: Rush information on your new COOLANT-KLEAN filter for grinder coolants.

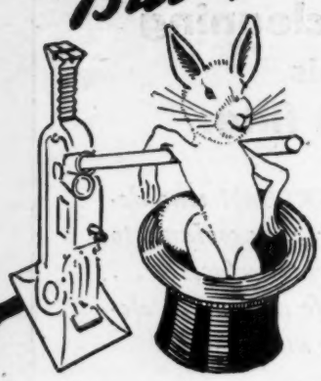
Name.....

Company.....

Address.....

Please send representative ☐

This Jack Does Everything But Talk



Incomparable versatility makes the Simplex No. 310A Emergency Jack a profitable investment for industrial plants, where it handles a surprising range of jobs safely and economically. It lifts vertically and lifts or pushes at any angle. Tilts on broad, stable base. Lifts on cap, corrugated toe or adjustable shoe that engages in cap, or from any intermediate height by using the chain as a sling. Double lever socket provides for close quarter operation. Machine corrugated toe lift prevents loads from slipping off, when jacking at an angle.

No. 310A. 15-ton capacity; height 22"; lift 14"; toe lift min. 2¼".

ARMY NAVY

Templeton, Kenly & Co.
Chicago (44) Ill.

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

with the company, because the company breaks even on a two-month item; if the job runs more than two months, the company gains by the excess.

As long as the operator gets a fair share of the savings he initiates, an award policy may be said to be sound. Companies differ as to what is a "fair share," but that problem is individual. However, in interpreting an award policy some stumbling blocks invariably turn up, and the policy has been modified occasionally to meet them.

Suppose a suggestion is rejected, and at a later date a new suggestion appears recommending the same thing. Conditions have changed, however, so that the suggestion can now be accepted. Who gets the award? Usually only the second suggester is paid, but in some cases duplicate awards must be paid.

Maintenance Suggestions

Maintenance suggestions, in Holtzer-Cabot experience, can have a certain nuisance value unless definite policy is established regarding them. Some companies pay for any maintenance suggestion that causes action. Here, however, it has been found more successful to pay only when the suggestion calls attention to a condition which would not be reported to management through normal channels.

Some suggestions require a great deal of engineering development before they can be used, but this company holds that the fairest policy is to pay the full value of the suggestion regardless of the amount of development work done on it. It is, after all, the suggester's idea which initiates an action that would not otherwise be taken.

This firm believes also that it has a moral obligation, if not a legal one, to pay a man for his suggestion, if accepted, even though he may have left the company. One company with this policy spent a great deal of time searching for a former employee, but when he was finally presented with the award, he said, "I didn't know I left that kind of company. Can I come back?" The policy obviously creates good feeling inside and outside the plant.

Occasionally a suggestion that shows good thinking is paid for, although it may not be usable at the time of acceptance. If the suggestion is used later, the actual savings are added to the nominal award already made. This policy seems to be appreciated.

Trouble over paying for materials a man uses in making up a suggestion at home is avoided by a policy of not paying for materials at all, except when

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Cab control permits high piling and accurate spotting of heavy, bulky loads.

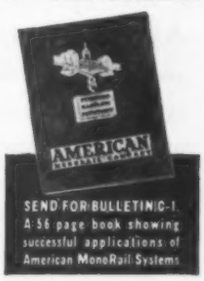
Special double bridge crane with swivel truck allows quick handling at furnace.

Hand operated crane for unloading trucks.

WILL SERVICE EVERY SQUARE FOOT OF YOUR OPERATING SPACE

American MonoRail Cranes supply overall coverage . . . your handling is not tied down to alleyways or spotting and unloading near permanent equipment.

American MonoRail Cranes are available for any type of job—heavy or light duty—full automatic—cab control or hand operated. They can be installed under present operating conditions without excessive structural changes.



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A 56 page book showing successful applications of American MonoRail Systems

Consult with the American MonoRail engineer, he will gladly explain this extremely easy method of handling—the low cost of installation and operation.

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WHAT TYPE of APRON DO YOU NEED?

There is a Rainfair apron for almost every conceivable industrial condition ranging from water to oil and including acids, alkalies and many other corrosive chemicals.

Each Rainfair apron is headed for a long and useful life because each is designed and engineered for a specific condition. From Rainfair's laboratory to final inspection these sturdy aprons are built to withstand the many hazards that have long played havoc with your employees. For greater job efficiency and improved employee relations protect your employees with Rainfair aprons . . . the product of more than 60 years of specialization in the manufacture of protective clothing for industry.

Rainfair's post-war Vulcanized Work Clothing is available now through Industrial Wholesalers everywhere. Write today for catalog of Rainfair raincoats, suits, hats and aprons, and the name of nearest distributor.

RAINFAIR, INCORPORATED • Dept. 25-L • RACINE, WIS.

RAINFAIR *VULCANIZED*
WATERPROOF WORK CLOTHING

a suggester makes a preliminary inquiry and gets the company's authorization to incur the expense of materails and tools for which he is to be subsequently reimbursed.

Foremen's Participation

Participation of foremen in the suggestion system is extremely desirable, but it is not easy to get. A large part of the success of a suggestion system depends upon the foremen's willingness to support it.

Here the view is that foremen must be made to feel that they are a part of management, and suggestion systems can help give them this feeling or they can hinder it, depending upon the handling. In either case the backing of a well-rounded industrial relations program is a requirement for success with the foremen.

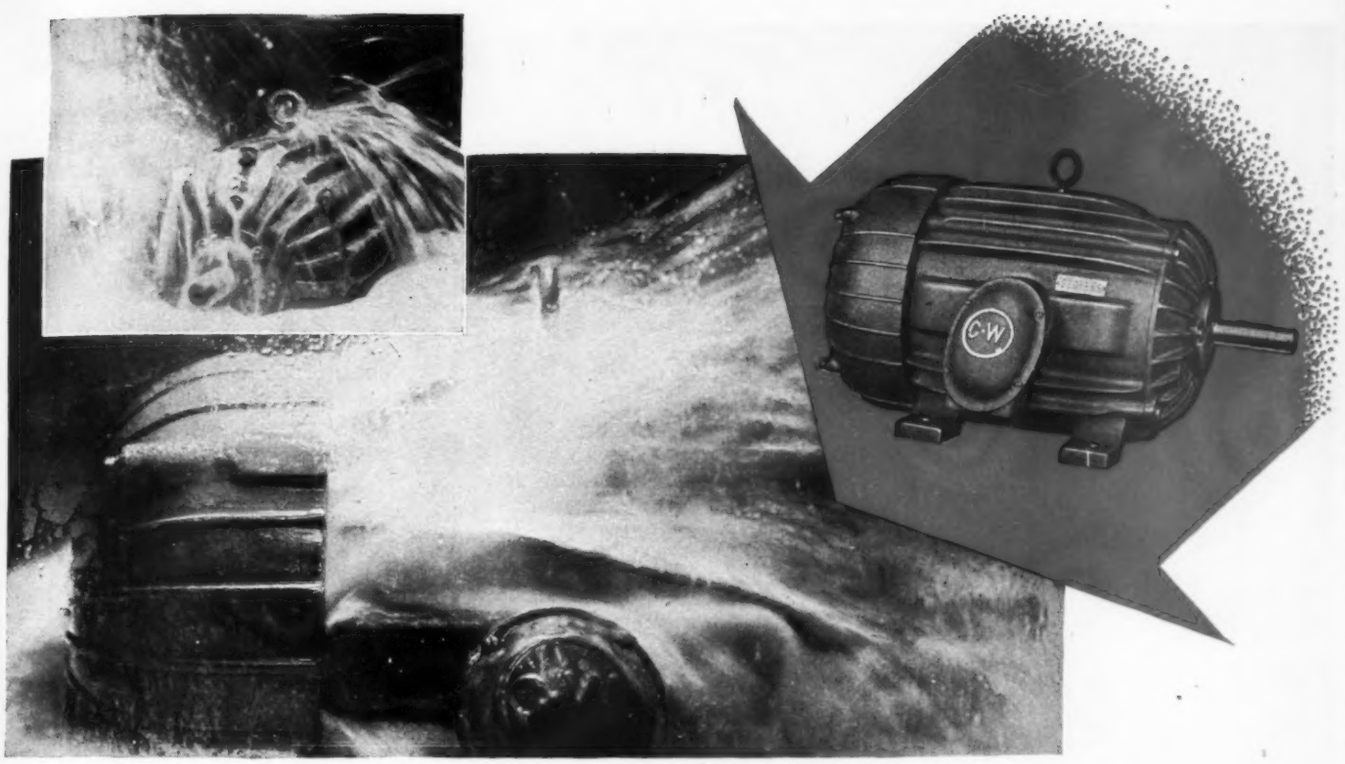
The suggestion secretary is the liaison man, and by skillful handling he emphasizes the foremen's management position. When he has a suggestion concerning one department, he discusses it with the foreman of that department, and keeps him posted on acceptance or rejection. A large part of his job is to sell the foremen the benefits accruing to them and to the company from such a system. This job is never-ending.

A foreman who feels insecure naturally resents suggestions coming from his own department, because he feels that he should have thought of them, or that they are in some way an adverse reflection on him. With proper and constant selling he can be convinced otherwise, but it takes time, and all of management must be behind the program.

Honorable Mention Letters

Holtzer-Cabot does not believe that foremen should receive awards for suggestions concerning their own departments, since improvements of all kinds are part of the normal responsibilities of the job. The company does send out honorable mention letters, however, signed by the works manager and by the president. In this way the foreman knows his ideas have been approved by top management, and his prestige receives a boost.

It was intended this year to pay foremen a percentage of all awards made in their departments to encourage foremen to stimulate their men, but, on the basis of information from other companies which have tried this policy, it was decided that this was not advisable. The reports indicated that foremen liked to share in awards made to men in their departments, but the men would not stand



A MOTOR takes a bath to prove a point

You can easily see that this new a-c **SEALEDPOWER** is a unique motor —with many exclusive features—but how will it stand up under really tough operating conditions? Can it withstand excessive moisture? What will be the effect of large quantities of dust in the surrounding atmosphere?

Answers had to be found to these questions before the motor could be offered to industry as an *improvement* over existing fan-cooled designs. So two brutal tests were devised:

In performing the first test a standard **SEALEDPOWER** motor was placed in a tank containing six inches of water, and run for eight hours without stopping; it was then shut down and the operation repeated the following day. All during the operating period the ventilating fan of the motor continued to throw water over the frame, shields, bearing housings, shaft and junction box (see illustrations), thoroughly drenching the entire exterior of the motor and yet, at the end of the test, the motor was taken apart—and the inside was found to be "bone" dry! Excessive moisture will offer no problem to this motor.

In the second test, a dense atmosphere of French chalk was kept whirling around the motor by means of fans. But, at the conclusion of this test, not a trace of chalk was found on the windings or elsewhere within the motor—conclusive proof that the **SEALEDPOWER** motor is truly dust tight.

An exclusive Crocker-Wheeler design, the **SEALEDPOWER** motor is suitable for applications where you have been using conventional fan-cooled motors. Why not try one of these motors—in an unusually damp or dusty location?

Send for full information. Please write on your company letterhead—no obligation.

THIS COUPLING IS UNIQUE, TOO

The Crocker-Wheeler resilient flexible coupling consists of a spider, a flange, a ball retaining cover and six synthetic rubber balls—that's all there is to it! And yet, this is more than just a trouble-free coupling—it actually adds years to the life of both the driving and driven machines.

The balls transmit torque, absorb shock and vibration, yet do not transmit end thrust. Available for shaft diameters up to 8", these couplings require no lubrication, no maintenance of any kind. Write for complete information.

CW-7

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A DIVISION OF JOSHUA HENDY IRON WORKS, AMPERE 37, NEW JERSEY

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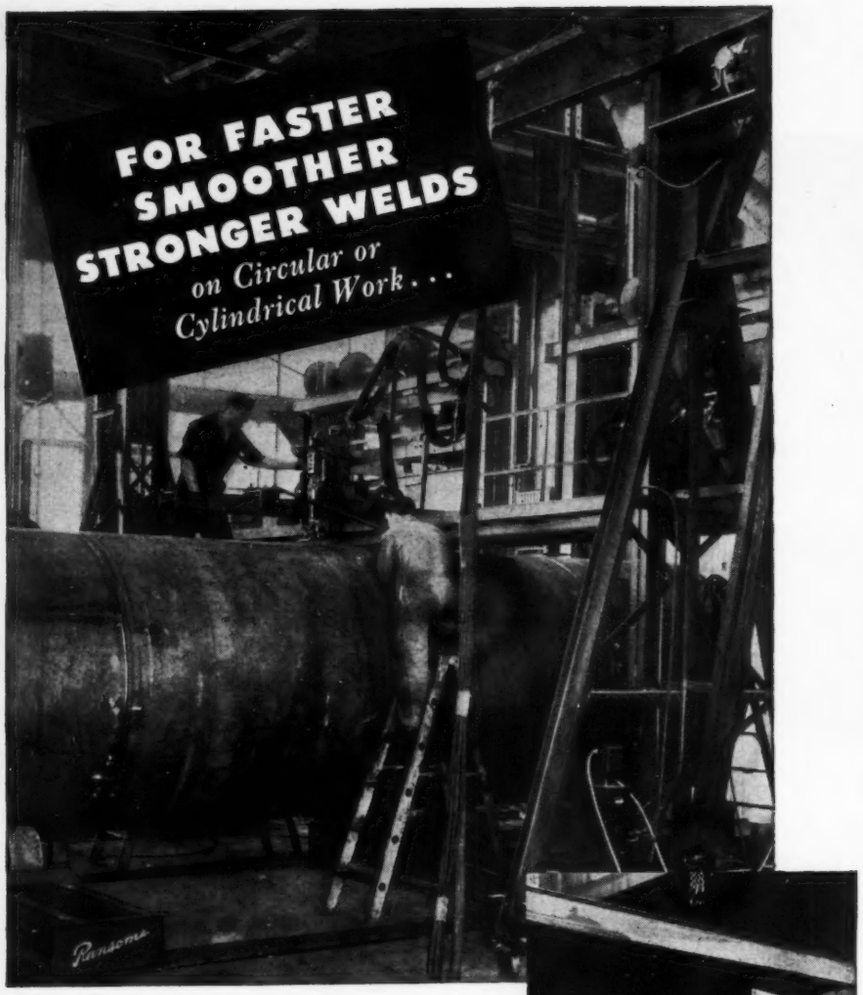

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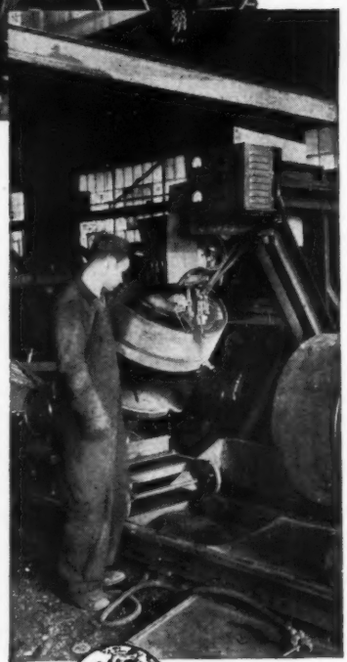
Whatever the weight or diameter of your circular or cylindrical work up to 75 tons and 14 ft,, there's a Ransome Positioner or Turning Roll Unit for rotating it at the right speed that will give you all the time-material-labor-saving benefits of automatic welding. Stronger, smoother welds . . . as much as 50% faster production. Investigate Ransome Positioners and Turning Rolls—today. Bulletin 210 gives all the facts.



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24RS-18

for it. They took the view that this gave the foreman something for nothing.

This year Holtzer-Cabot is experimenting by giving a $50 War Bond to the foreman whose department has the most accepted suggestions at the end of the year, and another bond to the foreman whose department has the highest award total.

The foremen hand out award checks to the men in their departments. This idea is good provided the suggestion system is well established and its benefits are thoroughly believed in by the foremen.

Signed or Anonymous?

This leads to a discussion of whether it is better to have the names of suggesters in plain view at all times, or to keep the suggestion entirely anonymous. Since anonymity in the system is primarily for the protection of the men, it is usually agreed that programs should begin with an anonymous system. After the system has been sold from top management down, and the foremen thoroughly believe in it, then it is better to have some of the cards out on the table. Publicity is easier, and better understanding can be developed.

At Holtzer-Cabot a middle course is followed. The suggester remains anonymous until the time of the award, or until further information is needed. If use of his name is needed, his permission is asked. Thus, in the main, the system remains anonymous for the benefit of employees who may still feel they need anonymity.

There are certain exceptions to the company's policy of not paying for suggestions from supervisory help, or from engineering, methods, or time study men. Suggestions from these men are paid for when they are outside of the normal responsibilities of the job. This modified ruling is found successful in producing occasional outstanding suggestions.

Need for Time Limit

One important aspect of eligibility is a time limit for each suggestion. Companies with no time limit find eventually that they have a massive cross-reference file, and they are often faced with an aggrieved employee who feels that his suggestion, submitted perhaps five years ago, has been infringed upon by a recent award for another suggestion.

Holtzer-Cabot's system has a two-year limit, and even during that relatively short time it has been found that a great part of each day is spent at the cross-reference files checking new sug-

ROLLING THROUGH INDUSTRY!

Bassick "Floating Hub" Wheels

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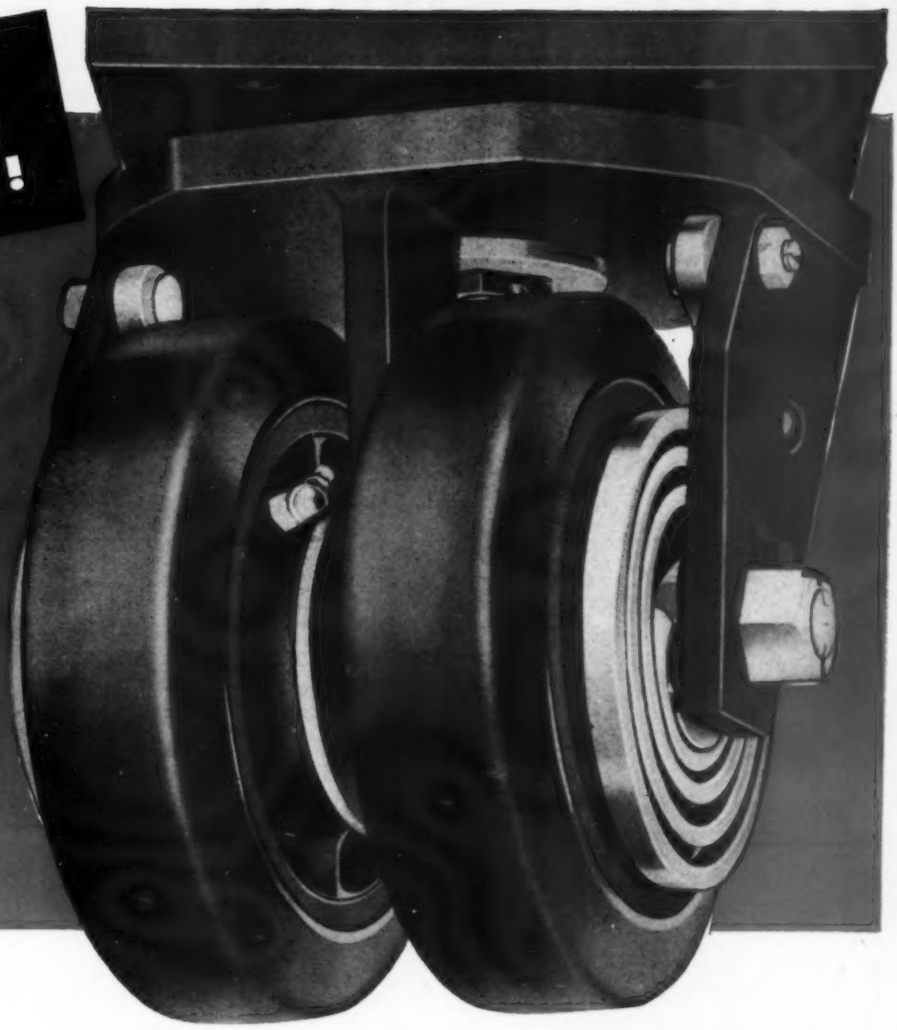
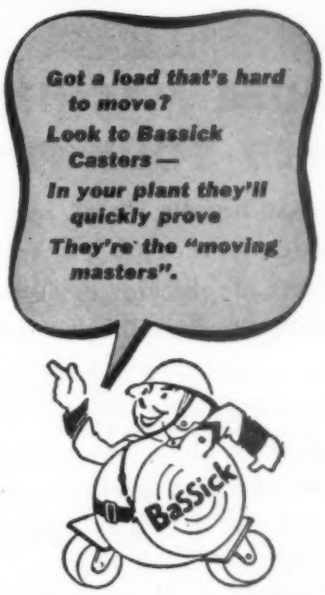


Machinery, equipment, production fixtures and materials of a thousand and one different types that should not be "pushed around" by ordinary means are now riding smoothly and safely on these ultra-modern casters or wheel mountings. The "Floating Hub" principle, developed by Bassick, protects materials carried, saves floor surfaces, gives increased mobility and longer life to all equipment.

Shock absorption is *built into* the sprung wheels . . . makes them ride over the rough spots without lifting or jolting the load . . . keeps all of them in constant contact with the floor. Single and dual wheel types, in sizes supporting loads up to 2000 lbs. each.

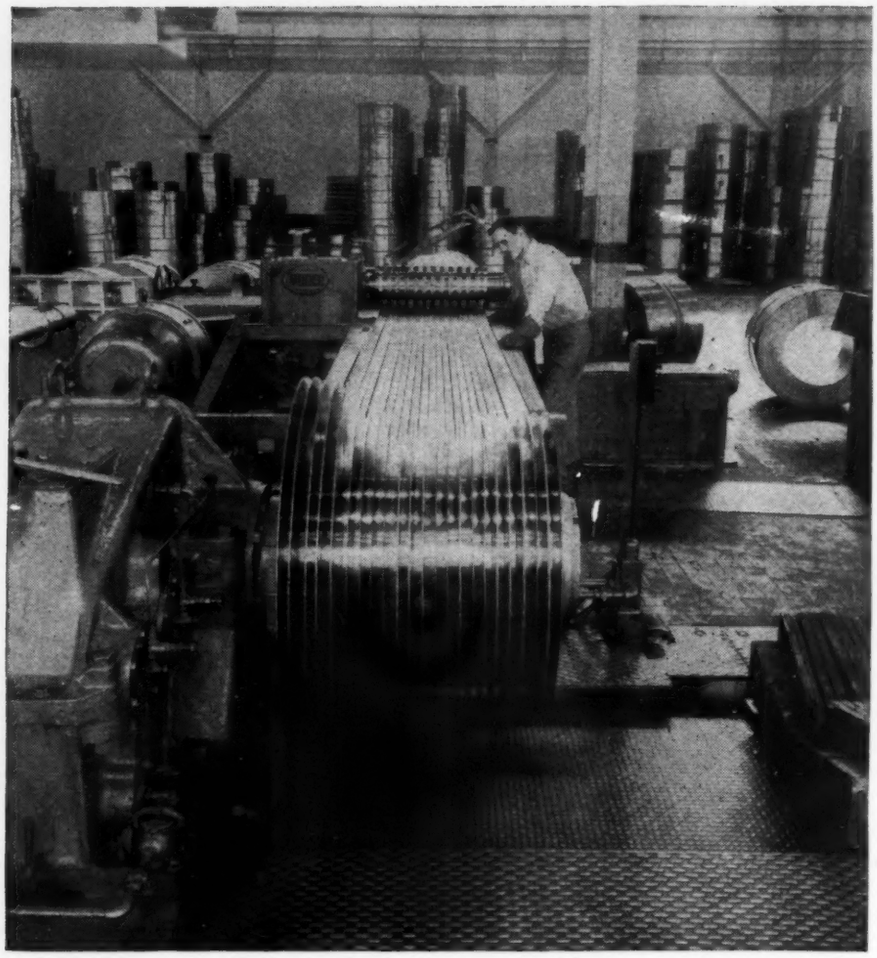
Bassick "Floating Hub" Casters and Wheel Mountings, the latest development in the world's most complete line, can benefit *your* production. For detailed information, write to THE BASSICK COMPANY, Bridgeport 2, Conn. Division of Stewart-Warner Corporation. Canadian Division: Stewart-Warner-Alemite Corporation, Ltd. Belleville, Ont.


Got a load that's hard to move?
Look to Bassick Casters —
In your plant they'll quickly prove
They're the "moving masters".
Bassick

Making more kinds of Casters... Making Casters do more

Bassick

IF YOU HANDLE SHEET METAL—



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The YODER COMPANY

METAL WORKING PRODUCTION MACHINERY

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gestions for previous ones. Even s mistakes are made and they hu morale, no matter how quickly an justly they are cleared up.

With a time limit, an employee ca resubmit his suggestion, if he wants to go on record for the followin period. Otherwise, the newest sug gestion receives any resulting award.

There is a wide divergence o opinion as to the fairest way of ha dling the investigation of suggestion Theories range from having one ma investigate all suggestions, whic means that the same judgment will b applied to all ideas, to splitting th investigating among department head or among several part-time men, whic means that men who know the mo about a certain field investigate al suggestions in that field.

Committee for Investigations

In this company the system wa begun with the suggestion secretar investigating all suggestions, but no the members of the suggestion com mittee investigate the suggestions tha deal with their departments, and th suggestion secretary handles sugge tions that come under the heading o company policy. The committee i made up of five men, representin production, production control, pro duction engineering, inspection, an engineering development. This invest gation procedure has proved satisfa tory for several reasons. The committe members know their own fields an consequently investigations are mad quickly and accurately. The sugge tion secretary was chosen more fo his knowledge of men than of ma chines. The investigations are late tempered by extremely critical com mittee meetings at which the sugge tion secretary plays a primary role.

The procedure has another value i getting the cooperation of the variou departments represented on the com mittee. These departments feel a re sponsibility to the suggestion syste when they are making the investig tions. As a consequence a great de more interest is displayed.

The suggestion secretary writes a letters, sees that all accepted sugge tions are installed, does all the contac work with foreman and suggesters, an handles the publicity.

A methods engineer is available t assist suggesters in developing idea and to put into effect accepted electri cal and mechanical suggestions. Thi methods engineer is on the commi tee to represent production enginee ing. Of the committee members, h is the busiest with suggestion duties although all committee members giv their time freely to suggesters.

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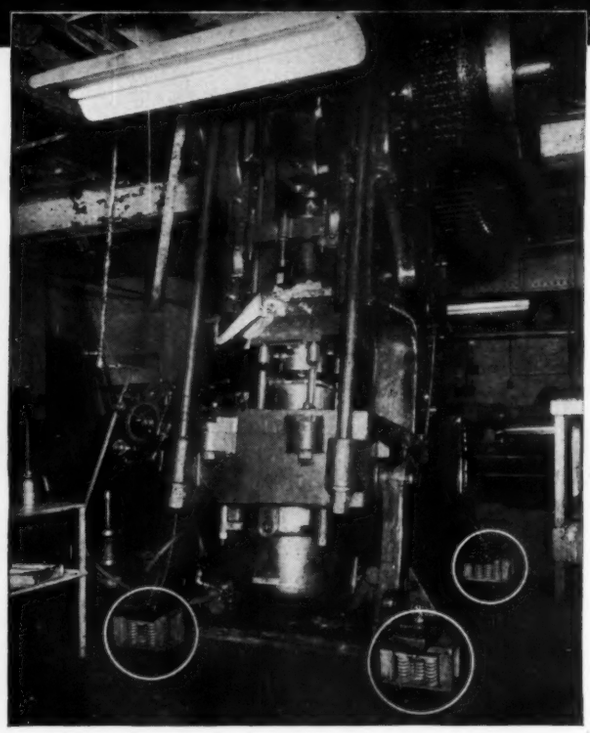
Now is the Time to Isolate Costly Punch Press Vibration



Four Korfund Type SL/H Vibro-Isolators effectively absorb the shock from this Bliss 100 Ton Capacity Press

You can't operate punch presses without vibration. Whether you realize it or not, uncontrolled vibration takes a constant toll in building damage, machine breakdowns, accidents, spoiled work and lowered employee efficiency.

But there is no reason why you can't be protected from vibration. Vibration can be isolated completely—and economically—through Korfund Vibration Control.

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BOOKS

THE SUCCESSFUL EMPLOYEE PUBLICATION

Paul F. Biklen, and Robert D. Breth, formerly Director of Public Relations and Assistant Director of Public Relations, respectively, of Kaiser Cargo, Inc., Fleetwings Div., and Editor and Assistant Editor, Fleetwings News and Arrow. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 179 pages. Photographs, forms, index. $2.

One of the "Industrial Organization and Management Series." A manual for editors of house organs giving pointers and data not only on the establishment of policies, but also on the operating details of editing and publishing such plant papers.

THE PRODUCTION CONFERENCE

Jack L. Wolff, Supervisor, Shipyard Training, Division of Shipyard Labor Relations, U. S. Maritime Commission, Washington, D. C. Houghton Mifflin Co., 2 Park St., Boston. 179 pages. $2.25.

In production conferences management and labor have a tool that releases the full energy of employees and supervisors as well as of executives. Book is designed to point out the value of such conferences, and to show how to run them. Chapter headings include: "Management, Labor, and the Production Conference"; "Improving Supervision to Improve Production"; "The Production Conference"; "The Production Conference in Action"; "The Production Conference as a Teaching Device"; "Putting Production Conference Reports to Work"; "Administering a Production Conference Program."

GUIDEPOSTS TO A FREE ECONOMY

Harley L. Lutz, Professor of Public Finance, Princeton University, Princeton, N. J. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 206 pages. $2.

Essays on federal fiscal policy, taxation, and public expenditures explain the fiscal forces that work to build or destroy a nation. Titles include "The National Income"; "The Private Enterprise System"; "Who Bears the Burden of Business Taxes"; "The Treasury's Case Against the Sales Tax"; "Debt, Taxation, and Functional Finance"; "Social Security"; "Government and Unemployment"; "Post-War Debt Management"; "National Planning Rampant"; "A Short Cut to Serfdom"; "A Simple Recipe for Prosperity."

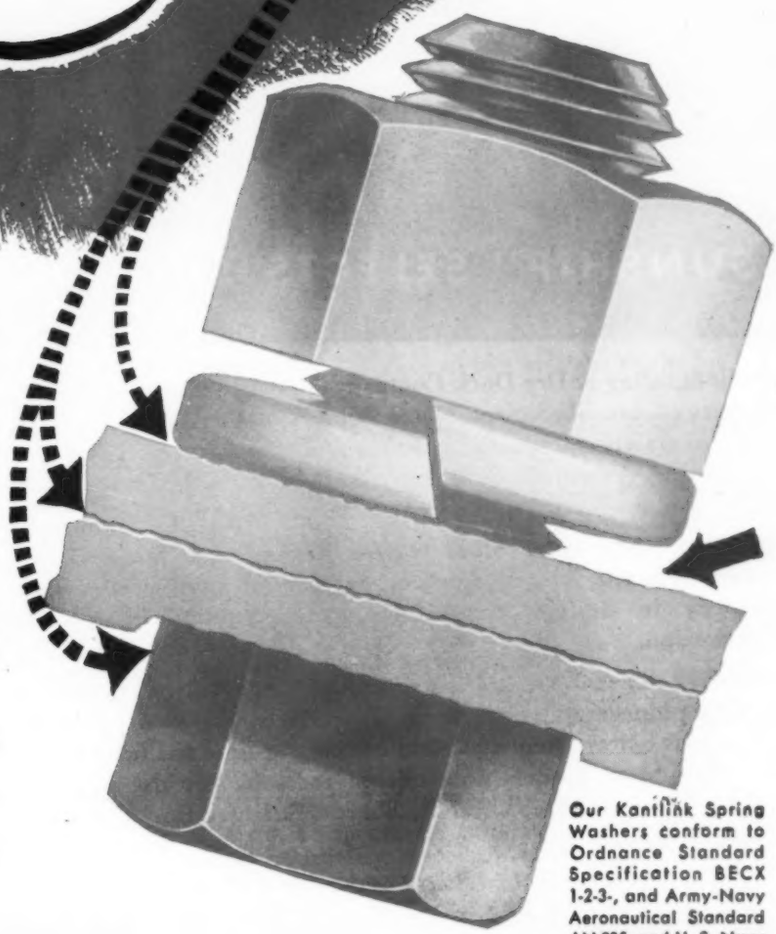
THE PSYCHOLOGY OF PERSONNEL

Henry Beaumont, Professor of Psychology and Director of the Bureau of Industrial Psychology, University of Kentucky. Longmans, Green & Co., 55 Fifth Ave., New York. 306 pages. Index. $2.75.

Account of the contributions psychology is making to the problems of dealing with employees. Describes methods and policies that have brought practical results. Stresses the reconversion problems of personnel, disabled war veterans in industry, occupational adjustments, women workers, music in industry, contributions made by the Army training system. Eleven sections: Understanding Employees; Analyzing Jobs; Selecting Employees; Training Employees; Working Conditions; The Work-

LOOK THERE..... MR. ENGINEER

That's where the (RAT)TLE is-



Don't worry about the nut;—nuts don't budge while there's even the slightest pressure between their threads and the threads of the bolt.

But below—down there between those other contacting surfaces—there's the rub—there's the (rat)tle—there's the vibrational wear that loosens all other parts unless you use a powerful live spring washer.

Kantlinks—the big powerful long-range spring washers—retard initial wear as it occurs, and keep expanding as fast and as far as wear develops. They hold all parts tight.

No matter whether you use a standard nut or any one of the many fixed or lock-nuts be sure to specify also a strong spring washer.

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"Sunship," like many other leaders in American business and industry, selected Sunroc Coolers because of their well-known superiority in design, construction, and economical, trouble-free operation.

Sunroc Water Coolers are the sole, highly specialized product of one of the pioneers in the water cooler industry. Experience in meeting rigorous Government specifications in war-time has further perfected the Sunroc models now offered for sale. For the complete Sunroc story, write Dep't FM-11, Sunroc Refrigeration Company, Glen Riddle, Pa.

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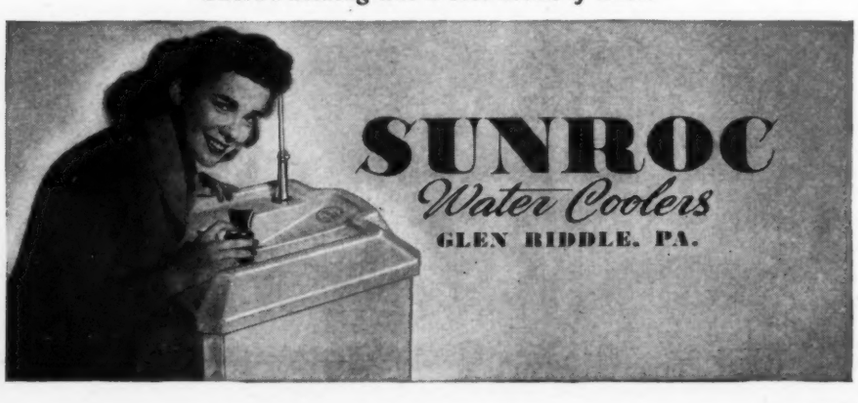

ers' Health; Promoting Safety; Supervision; Merit Rating; Providing Incentives; Occupational Adjustment.

PIPING HANDBOOK

Sabin Crocker, Senior Engineer, Engineering Division, The Detroit Edison Company. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 1376 pages. Drawings, tables, charts, index. $7.

Fourth edition. Book provides, for engineer, designer, and contractor, a compilation of the data necessary for the effective use of piping in its engineering and industrial applications—steam and power plant piping, heating and plumbing systems, oil and gas piping—from water distribution to hydraulic systems for airplanes. Covers scientific fundamentals, materials, and design and installation practice, and gives construction details, cost analyses, dimensional standards, material specifications, definitions, charts, and formulas.

ASME MECHANICAL CATALOG AND DIRECTORY, 1946

American Society of Mechanical Engineers, 29 West 39th St., New York. 822 pages. $3.

Thirty-fifth annual edition. In four sections: Catalogs, with descriptions and photographs of hundreds of items used by industry; directory, showing source of equipment needed by mechanical engineers; alphabetical list of trade names; and a catalog supplying information about ASME codes, standards, periodicals, published by the society.

FINANCING AMERICAN PROSPERITY

Edited by Paul T. Homan and Fritz Machlup. The Twentieth Century Fund, 330 West 42nd St., New York 18. 508 pages. Index. $3.

Subtitled "A Symposium of Economists," book presents prescriptions of six of them—Benjamin M. Anderson, John Maurice Clark, Howard S. Ellis, Alvin H. Hansen, Sumner H. Slichter, John H. Williams—for a healthy functioning of the economic system of the United States to provide high levels of production and employment. Titles of the contributions are: "The Road Back to Full Employment"; "Financing High-Level Employment"; "Economic Expansion Through Competitive Markets"; "Stability and Expansion"; "Public Policies and Post-War Employment"; "Free Enterprise and Full Employment." Book is concluded with a summary and analysis by Fritz Machlup.

BOOKLETS

SHOULD PRICE CONTROL BE RETAINED? Harold G. Moulton and Karl T. Schlotterbeck. The Brookings Institution, Washington, D. C., 43 pages. Tables. 50c.

MANAGEMENT AND THE FOREMAN. Foremen's Unionization; Foreman Attitudes; Incentives for Foremen; The Foreman's Status in Management. Production Series No. 154. American Management Association, 330 West 42nd St., New York. 20 pages. 50c.

FINANCIAL INCENTIVES for Supervisors and Executives. Selected reading list prepared by E. P. Hollywood. Industrial Relations Section, California Institute of Technology, Pasadena 4, Calif. 4 pages. No charge.

THE DEVELOPMENT OF FOREMEN IN MANAGEMENT. Part 2 of a Study of the

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NEWEST COMFORT FEATURE OF HY-TEST Safety Shoes

Top slants gradually to front of shoe so that shoe top does not chafe or cause irritating rub in walking. The rounded corner lets the foot flex and bend at ease . . . no square-cut corner to bite into the ankle.

No raw edge in Slant-eze. The edging of tops and lace-stays is skived, folded and then stitched to give a neat "dressy" look and a smooth, easy-wearing feel.

Here's the new slant that does away with ankle-biting of sharp-corner uppers . . . makes it possible for workers to keep safety shoes always fully laced and still enjoy perfect foot comfort. By slanting the top and rounding the corners, Hy-Test creates a new design, the advantages of which are readily evident to all who wear work shoes.

These are the shoes workers will lace up neatly and fully . . . no loose strings to catch in moving machinery . . . no gaping, unlaced uppers to tire the feet and rob the worker of important ankle support. Hy-Test's new Slant-eze top brings extra freedom . . . permits more "bend", allows twisting and stooping without suffering that irritating rub of rough leathers against the ankle.

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With all the extra protection from Hy-Test's exclusive Anchor-Flange Steel Box Toe, and with the extra comfort of the shoe itself, it is easy to understand why so many workers prefer Hy-Test Safety Shoes.

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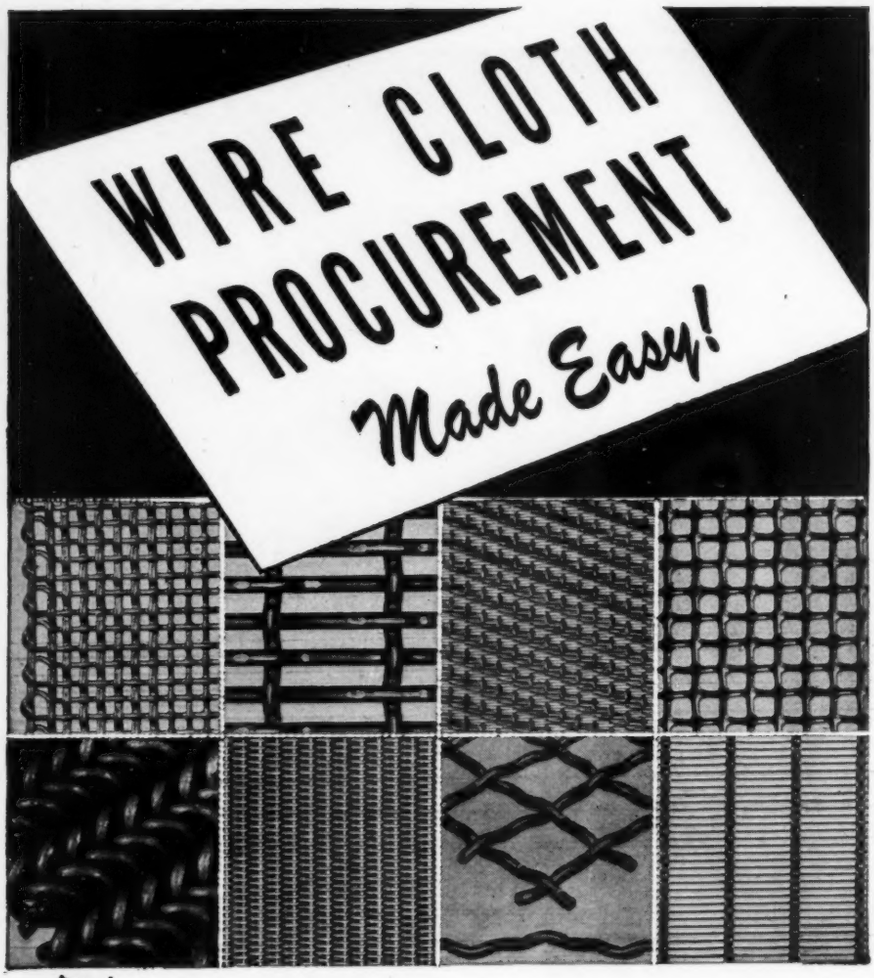

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Foreman's Role in Industry. Research Report No. 7. American Management Association, 330 West 42nd St., New York 18. 94 pages. Bibliography. Extra copies for members, $1.50 each; non-members, $2.50.

•

ON THE CALENDAR

NOVEMBER

1–2, Industrial Management Society, National Time and Motion Study Clinic, Continental Hotel, Chicago. L. M. Glassner, Chairman, 205 West Wacker Drive, Chicago 6.

30–Dec. 1, Society for the Advancement of Management, Annual Conference, Waldorf-Astoria Hotel, New York. Carl S. Coler, Executive Director, 84 William St., New York.

DECEMBER

5–7, National Association of Manufacturers, Congress of American Industry, Waldorf-Astoria Hotel, New York. James M. Boyd, Director, 14 West 49th St., New York 20.

7, American Leather Belting Association, Annual Meeting, Commodore Hotel, New York. E. R. Rath, Executive Vice-President and Secretary, 41 Park Row, New York.

7, American Standards Association, Annual Meeting, Biltmore Hotel, New York, Dr. P. G. Agnew, Secretary, 29 West 39th St., New York.

10–12, The American Society of Refrigerating Engineers, 41st Annual Meeting, Hotel Pennsylvania, New York. Charles Leopold, Program Committee Chairman, 40 West 40th St., New York.

11–12, National Association of Suggestion Systems, National Conference, Hotel Sherman, Chicago. F. A. Denz, Chairman, Public Relations, 122 South Michigan Ave., Chicago.

16–18, American Institute of Chemical Engineers, Annual Meeting, Stevens Hotel, Chicago. S. L. Tyler, Executive Secretary, 50 East 41st St., New York.

JANUARY

7–11, Society of Automotive Engineers, Inc., Annual Meeting and Engineering Display, Book-Cadillac Hotel, Detroit. John A. C. Warner, Secretary and General Manager, 29 West 39th St., New York 18.

21–25, American Institute of Electrical Engineers, Winter Technical Meeting, Engineering Societies Building, New York. H. H. Henline, Secretary, 33 West 39th St., New York 18.

COURSES
NOVEMBER
QUALITY CONTROL

6–16, Course in Quality Control by Statistical Methods. State University of Iowa. Professor Earle L. Waterman, College of Engineering, State University of Iowa, Iowa City.